TECHNOLOGY DEPT.

UNE, 1956

RUBBER WORLD

ntents, page 397

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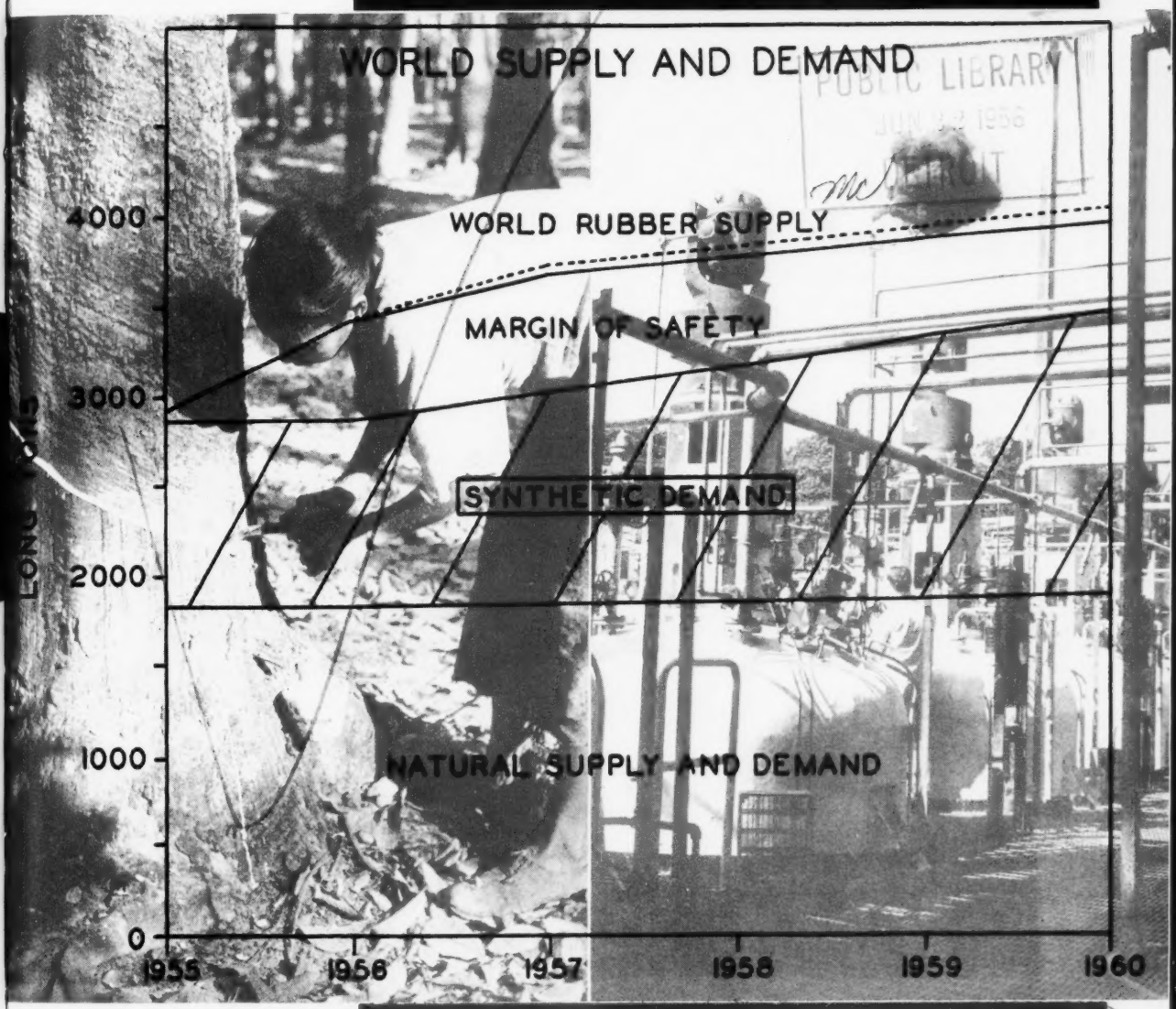

BILL BROTHERS

UBLICATION

GR-S—PRESENT AND FUTURE TRENDS

By R. G. Seaman, page 399

ANTOX

An Aldehyde Amine Anti-Oxidant

A liquid—disperses thoroughly and quickly. Protects against heat and normal aging. Reduces frosting. Discolors only very slightly.

- **Especially economical in natural rubber and GR-S stocks accelerated with thiurams and thiazoles because it activates the cure—permits use of reduced accelerator. Also increases modulus and tensile strength.**

Proven through years of service in molded goods, coated fabrics, latex-bonded paper and friction tapes. No other anti-oxidant is better in HYPALON* stocks to be used in high-temperature service.

*HYPALON is Du Pont's registered trademark for its synthetic rubber. (based on chlorosulfonated polyethylene)

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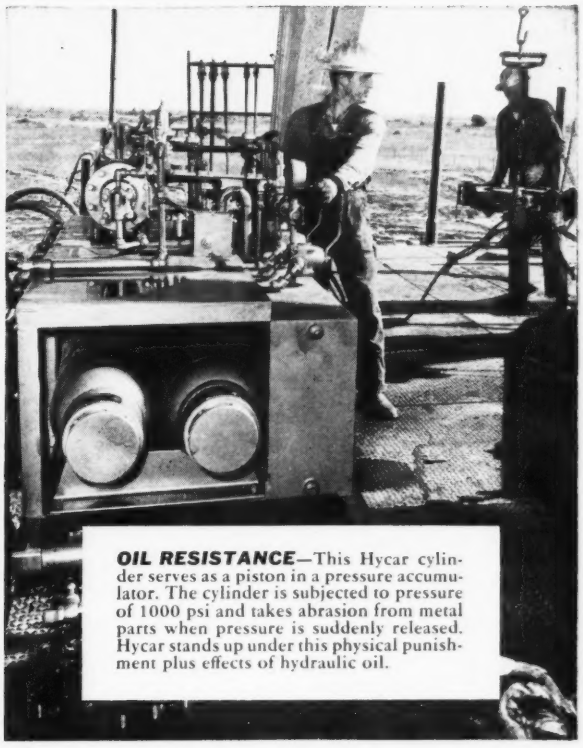
News about

B.F.Goodrich Chemical *raw materials*

RESILIENCE—A Hycar blanket fits around this cylinder that presses paper down on a printing press surface. The Hycar must "give" under pressure, yet snap back through millions of impressions, retaining original thickness within a thousandth of an inch.



OIL RESISTANCE—This Hycar cylinder serves as a piston in a pressure accumulator. The cylinder is subjected to pressure of 1000 psi and takes abrasion from metal parts when pressure is suddenly released. Hycar stands up under this physical punishment plus effects of hydraulic oil.

LONG WEAR—These roller skate wheels prove Hycar's exceptional wearing qualities. Wheels maintain perfect balance and roundness, keep a good grip on the surface. Hycar is easily molded for products like this, retains high dimensional stability.

How HYCAR AMERICAN RUBBER meets many requirements

HYCAR can be compounded to fit the needs of specific jobs like these. Hycar is resistant to oil, most solvents and chemicals, aging, and abrasion. Send for booklet listing properties of standard materials. Write Dept. ES-6, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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PHILBLACK® knows how to make rubber behave!

Natural . . . synthetic . . . butyl! Philblack gets good results with all kinds of rubber! And because there are four Philblacks, each with its individual characteristics, you can achieve desirable versatility in your rubber recipes.

Manufacturers of wire and cable jackets use Philblack A because of its electrical resistivity and its ease of processing. Makers of tires and industrial belts use Philblack O to promote electrical conductivity and longer life.

To select the Philblack best suited to your purpose, consult your Philblack technical representative. Phillips maintains a fully equipped, modern laboratory devoted to a long range program of research on all phases of the rubber industry. Valuable technical assistance and advice on carbon blacks and rubber is available . . . without obligation.

Meet the Philblacks!

DISCOVER WHAT THEY'LL DO FOR YOU!

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Ideal for smooth tubing, accurate molding, satiny finish. Mixes easily. High, hot tensile. Disperses heat. Non-staining.

Philblack I ISAF Intermediate Super Abrasion Furnace Black
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Philblack O HAF High Abrasion Furnace Black
For long, durable life. Good electrical conductivity. Excellent flex. Fine dispersion.

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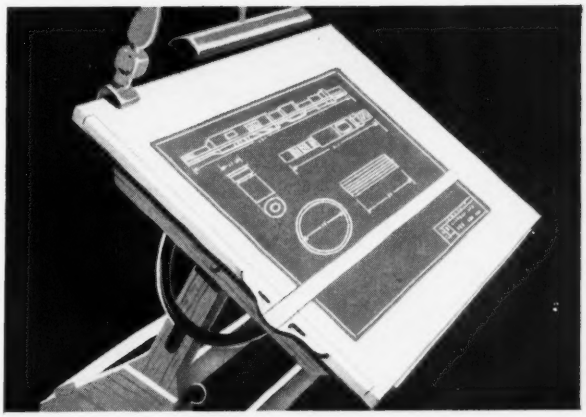
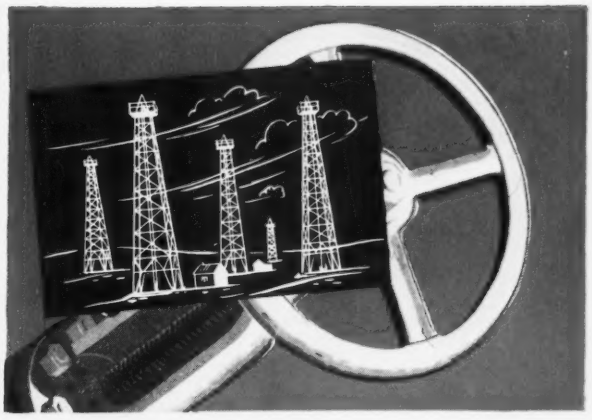
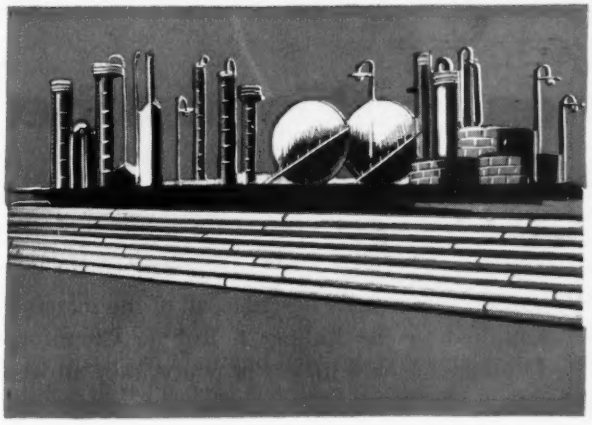
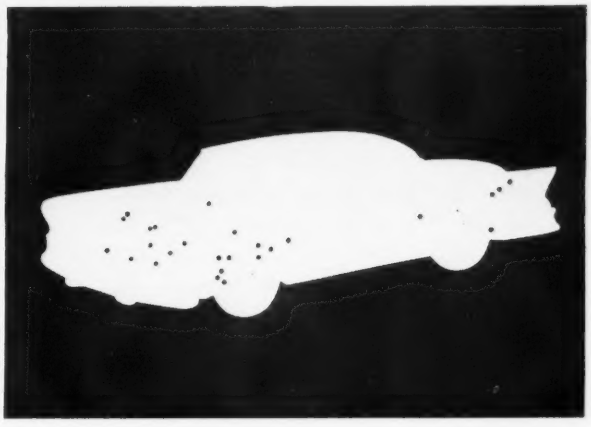
West Coast: Harwick Standard Chemical Company, Los Angeles, California.

Naugatuck Paracrils









...oil-resistant rubbers for all critical applications

In every industry, Naugatuck's family of superior oil-resistant rubbers is bound to bring longer service life under the most critical conditions. Graded to provide specific property values, the family of PARACRILS® provides:

- The most oil-resistant rubber available
- The best balance between oil-resistance and low-temperature flexibility.
- The best processing characteristics
- The most tightly-controlled product specifications
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If your rubber or rubber-like products require high oil resistance it will profit you to investigate Naugatuck's PARACRILS Why not write to us on your company letterhead TODAY?

Naugatuck Chemical

Division of United States Rubber Company
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Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices

NEW KIND OF FEED BAG is this big "pillow tank" of nylon fabric coated with CHEMIGUM. It holds 10,000 gallons of volatile fuel, yet can be carried in a small chest, rolled out like a rug, filled in minutes—anywhere.

"SUB" THAT'S NOW FIRST STRING is this basketball with cover of PLIOFLEX reinforced by PLIOLITE S-6B. It looks, feels, acts like leather, but is much more wear-, water- and scuff-resistant—lower in cost.

How to get the most out of rubber

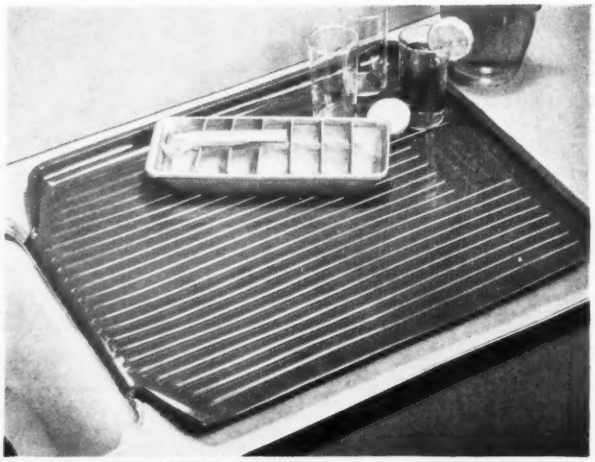
Each of the products pictured here has successfully met the test of today's competitive market. But there's no secret to this success. It stems from the simple fact that their manufacturers availed themselves of the new materials and services offered by the newly formed Rubber & Rubber Chemicals Department of the Goodyear Chemical Division.

The materials offered include two families of general-purpose styrene-butadiene polymers—PLIOFLEX Rubbers and PLIOLITE Rubber Latices. For oil-resistant applications, the CHEMIGUM Rubbers offer a range in both nitrile content and properties. For rubber reinforcement, there's PLIOLITE S-6B, a high-styrene resin. In non-staining antioxidants, WING-STAY S is the first of a line of job-designed rubber chemicals.

"Job-designed" aptly describes all of the materials supplied by the Rubber & Rubber Chemicals Department. As a matter of policy, they all were specifically developed to meet specific needs. And since proper application is essential to their advantageous use, it is also a matter of policy that their sale be accompanied by complete technical service.

Recognition of the need for thorough technical service was the basic reason for establishing the

COLORFUL COASTERS that stay bright and flexible are made of foamed PLIOLITE LATEX protected with WING-STAY S. They keep their "just bought" look and absorbency despite exposure to water, sunlight or repeated washings.



CHEERFUL HELPERS AROUND THE HOME are mats, strainers and other housewares of styrene rubber reinforced with PLIOLITE S-6B. The resin imparts toughness, rigidity and smoothness—adds to wear-, oil- and water-resistance.

ACID TEST IS TAKEN AND PASSED—every day in many ways—by strong, safe, easy-handled hose made of PLIOFLEX reinforced with fabric and, sometimes, steel wire. It's a flexible answer to many materials handling problems.

SOMETHING NEW UNDER THE CHRISTMAS TREE at many oil wells is an oil-resistant shoe sole consisting of CHEMIGUM blended with PLIOFLEX. This blend provides excellent combined wearing and oil-resistant properties at low cost.

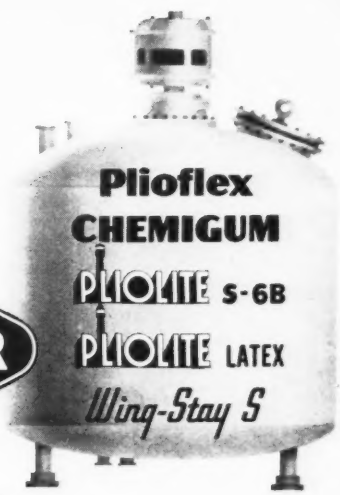
in eight different ways

Rubber & Rubber Chemicals Department. Its formation permitted the marshaling of the skills and experience of many technicians, plus the proper physical facilities to help you get the most out of rubber as easily and economically as possible.

Why not learn firsthand how the products and services of the Rubber & Rubber Chemicals Department can put your product in the same class with the eight shown here? It's easily done by writing to: Goodyear, Chemical Division, Dept. R-9418, Akron 16, Ohio.

RUBBER & RUBBER CHEMICALS DEPARTMENT

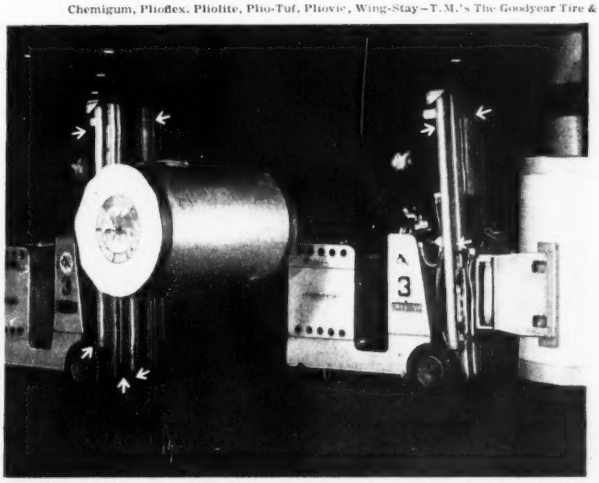
CHEMICAL GOODYEAR DIVISION



CHEMIGUM • PLIOFLEX • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS

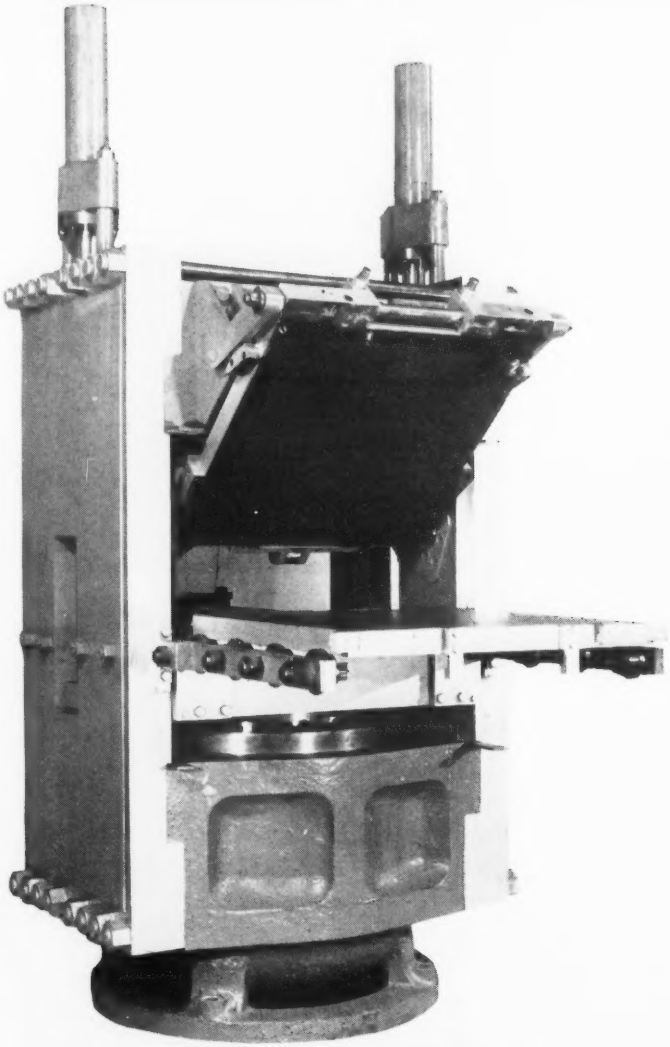
High Polymer Resins, Rubbers, Latices and Related Chemicals for the Process Industries

Chemigum, Plioflex, Pliolite, Plio-Tuf, Pliovic, Wing-Stay—T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio



PUTTING THE LIFT IN LIFT TRUCKS calls for tough, oil-resistant rings and seals in hoist and tilt rams. CHEMIGUM plus PLIOLITE S-6B gives the hardness, smoothness, strength and dimensional stability required.

LASTING ELASTICITY, STRENGTH AND SOFTNESS are essential in surgeons' gloves. Heat- and water-resistant WING-STAY S does much to help the natural rubber retain its original properties, despite repeated sterilization.



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32" x 32" Pressing Surface
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SIDE-PLATE PRESS

FAMOUS FOR UNMATCHED

ACCURACY, RIGIDITY and DEPENDABILITY

now available in standard sizes with an added feature:

AUTOMATICALLY RETRACTING AND TILTING HOT PLATES.

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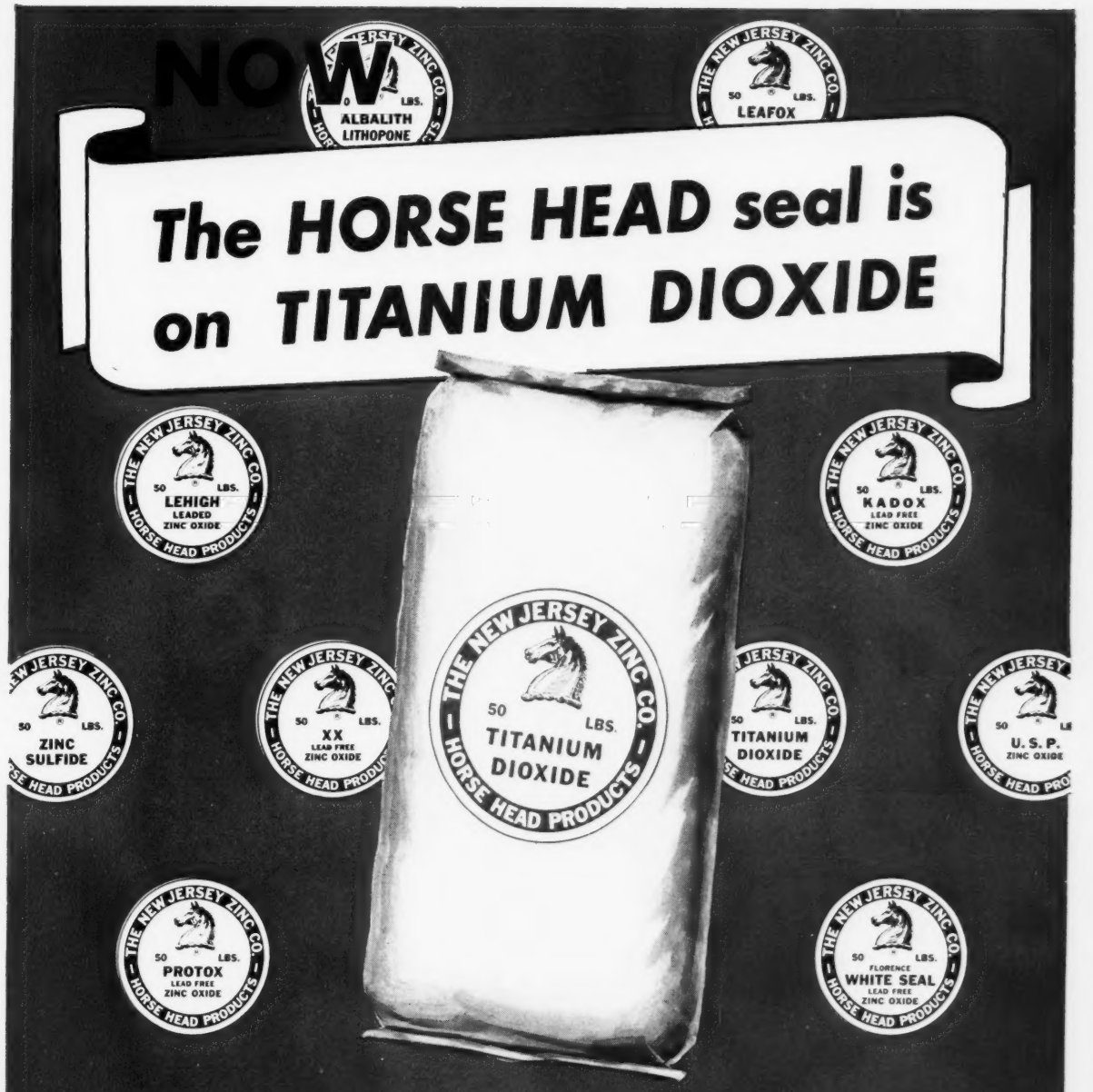

For over 100 years the Horse Head has been a symbol of trustworthiness to consumers of zinc pigments. Now the Horse Head trademark is on titanium dioxide.

From our newly acquired plant at Gloucester City, New Jersey, come various grades of anatase and rutile titanium dioxide pigments.

For ease in purchasing—titanium dioxide, zinc oxide, zinc sulfide and lithopone now are available to you from the same reliable source.

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The most complete line of white pigments

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A NON-MIGRATORY PLASTICIZER

Migration tests run on samples of PVC plasticized with **HARFLEX® 300** show no effect on polstyrene, or on varnish and alkyd enamel finishes. This permanent polymeric plasticizer has good compatibility and easy processing characteristics that eliminate the need for using secondary plasticizers as processing aids.

Manufacturers of plastic products or plastisols that must be extraction resistant will be interested in testing **HARFLEX® 300**. Samples of **HARFLEX® 300** for test or experimental work are available. Write for our free Technical Bulletin #1002-H which gives full information about this easy processing and efficient plasticizer.

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CRUDE RUBBER

For the best crude rubber connections in the world—look to Muehlstein! Muehlstein, with central offices in New York and London *and* direct agents in every corner of the globe, provides a constant flow of information on the best crude rubber offerings. Simply contact any Muehlstein office. You'll also find Muehlstein helpful on all types of Synthetic Rubber. A complete technical staff and laboratory facilities are available through home or regional offices.

Other Muehlstein products include Virgin and Reprocessed Plastics • Scrap Rubber • Hard Rubber Dust • Synthetic Rubber

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H. MUEHLSTEIN & CO.
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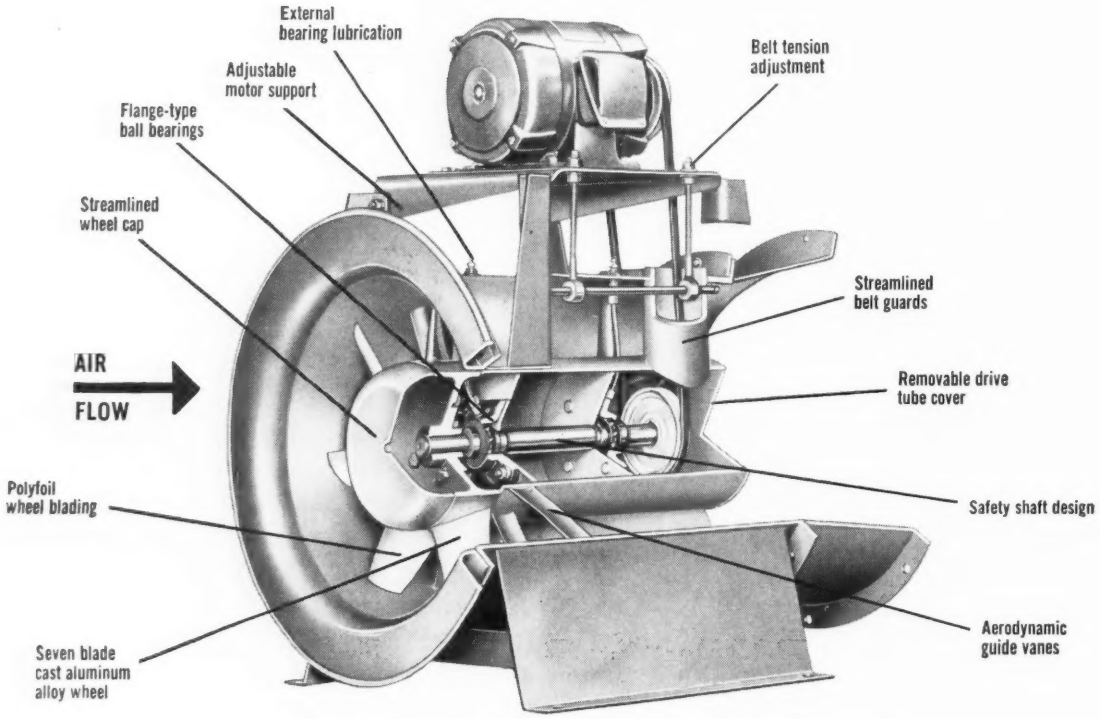
NEW Improved Westinghouse Axial Flow Fans

for Industrial air, fume, vapor handling jobs!



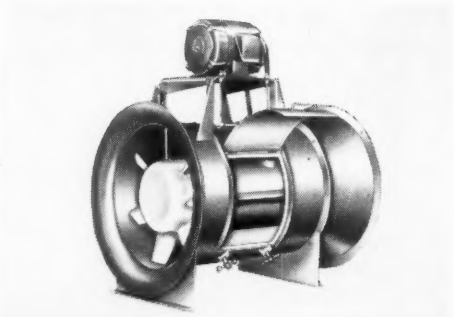
CUTAWAY VIEW OF WESTINGHOUSE AXIFLO® VANEAXIAL FAN FOR GENERAL APPLICATION.

COMPLETE NEW LINE

With: volumes from 1,700 to 100,000 CFM—static pressures up to 3¼"—14 sizes, Vaneaxial or Tube Axial, direct-connected or V-belt driven, with wheel diameters from 15" to 72".

- **Space Saving** . . . compact Axial Flow design permits installation directly into duct work.
- **Improved performance** . . . non-overloading horsepower feature permits use of smaller motors.
- **Least maintenance** . . . rugged practical construction insures continuous trouble-free operation.

For complete application service, call your nearest Sturtevant Sales Engineer, or write Westinghouse Electric Corporation, Sturtevant Division, Dept. 10F. Hyde Park, Boston 36, Mass.



Spray booth Vaneaxial Fan specially designed to provide easy access required for paint spray exhaust!

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU***

J-80592

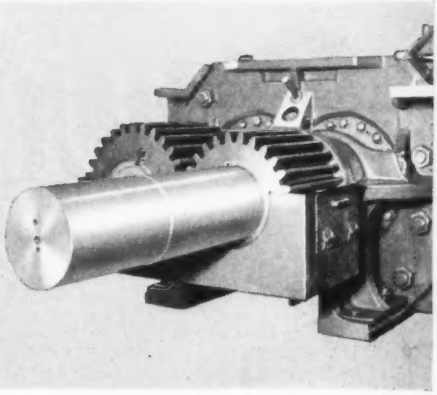
3 ADVANTAGES

of Banbury® mixer rebuilding by Farrel-Birmingham

1 BODY EXCHANGE PLAN

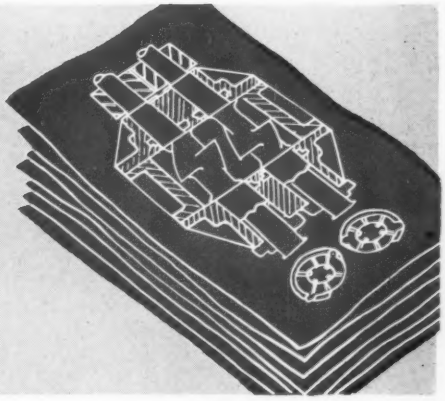
You can get fastest service by turning in your old Banbury body for a new one. Stocks of new bodies are carried at our Buffalo plant for shipment to western points; at our Derby plant for shipment to eastern points.

When you can plan ahead on your shut-down period, we can usually reserve a rebuilt body from the number continually in process at our Derby plant. Rebuilt bodies cost less than new ones but carry the same guarantee.



2 PRECISE REBUILDING

As the original builders of the machine, Farrel-Birmingham is the only company that has complete plans showing the dimensions of every part of your Banbury mixer. This is essential information for correct and precise rebuilding. When a part is worn, blueprints show the F-B engineer just how much rebuilding is required to return the part to its original size, contour and work capacity. There is never any guesswork.



3 GOOD-AS-NEW PERFORMANCE

A Banbury mixer rebuilt by Farrel-Birmingham benefits from a product-improvement program that has been carried on during the manufacture of over 2,000 Banburys. Modern design features and improved materials can now be incorporated into new and rebuilt bodies alike. Every Banbury that leaves our shop after rebuilding carries a new machine guarantee, providing assurance that the rebuilt machine will be as "good as new" when returned to service.

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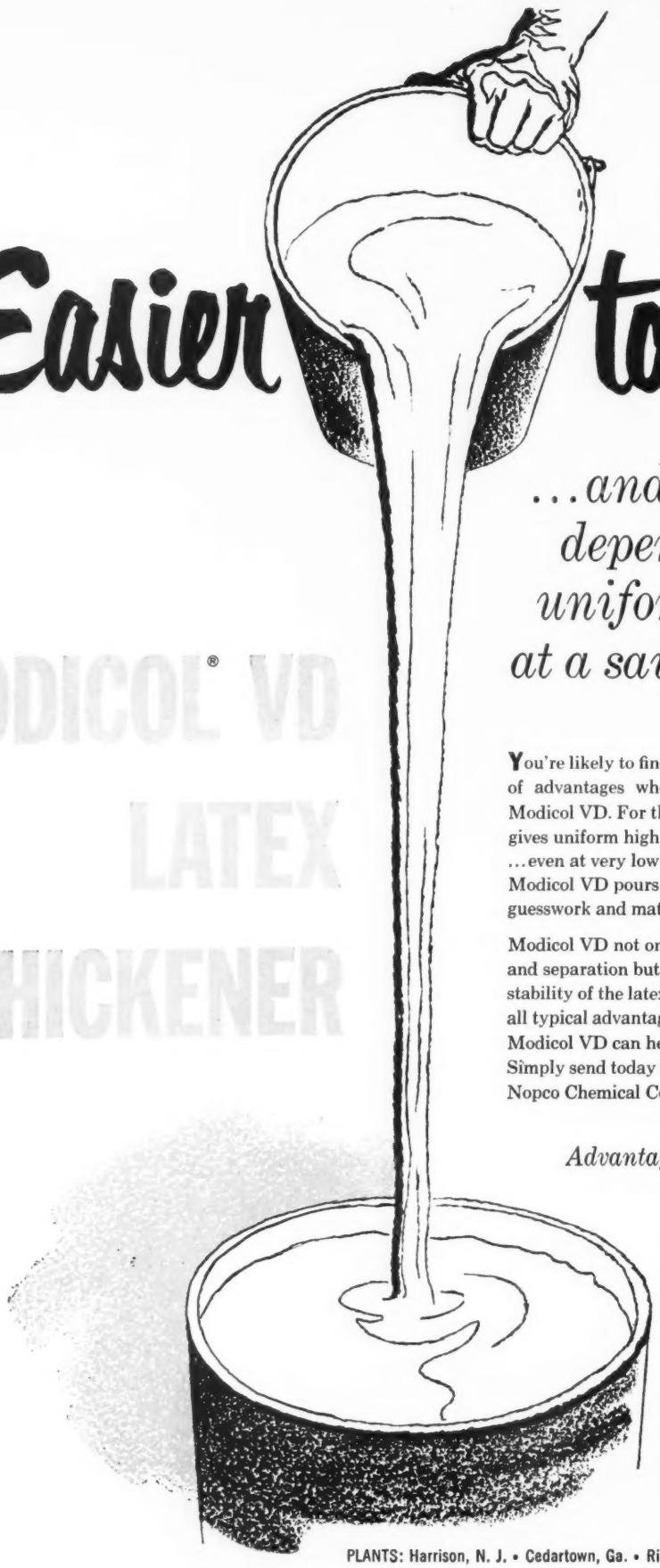
Farrel-Birmingham®

FB-1075

Easier to use!

...and gives you dependably uniform viscosity at a saving!

MODICOL® VD
LATEX
THICKENER



You're likely to find an ideal combination of advantages when you thicken latex with Modicol VD. For this synthetic polymer gives uniform high viscosity.. smooth and gel-free ...even at very low concentrations. Modicol VD pours easily, saves you time, guesswork and material waste.

Modicol VD not only eliminates creaming and separation but also improves mechanical stability of the latex emulsions. These are all typical advantages. Why not find out how Modicol VD can help improve your own processing. Simply send today for bulletin MVD 33 to Nopco Chemical Co., Harrison, N. J.

Advantages of MODICOL VD

Easy to handle

High uniform viscosity at low concentrations

Smooth gel-free type of viscosity

Stable in alkaline fluids

Unaffected by bacteria or fungi

NOPCO

PLANTS: Harrison, N. J. • Cedartown, Ga. • Richmond, Calif. • London, Ont. Canada

New plant doubles production of Glidden Zopaque Titanium Dioxide

Here's an up-in-the-air view of the new multi-million-dollar Adrian Joyce Works, Baltimore, Maryland. This modern titanium dioxide processing plant represents the first step in a broad expansion program designed to provide better service for the many users of Glidden ZOPAQUE Titanium Dioxide.

Glidden ZOPAQUE Titanium Dioxide is the finest, whitest white pigment available for use in rubber, plastics, paint, paper, ceramics and other products.

Glidden research has achieved greater whiteness and an accelerated dispersion rate in new ZOPAQUE. These developments combine to produce pigments with outstanding gloss and color retention as well as low reactivity.

Chances are Glidden ZOPAQUE Titanium Dioxide can help you give greater whiteness to the white products you manufacture. Available in both Rutile and Anatase grades. Write today for complete information.

THE GLIDDEN COMPANY

Chemicals—Pigments—Metals Division

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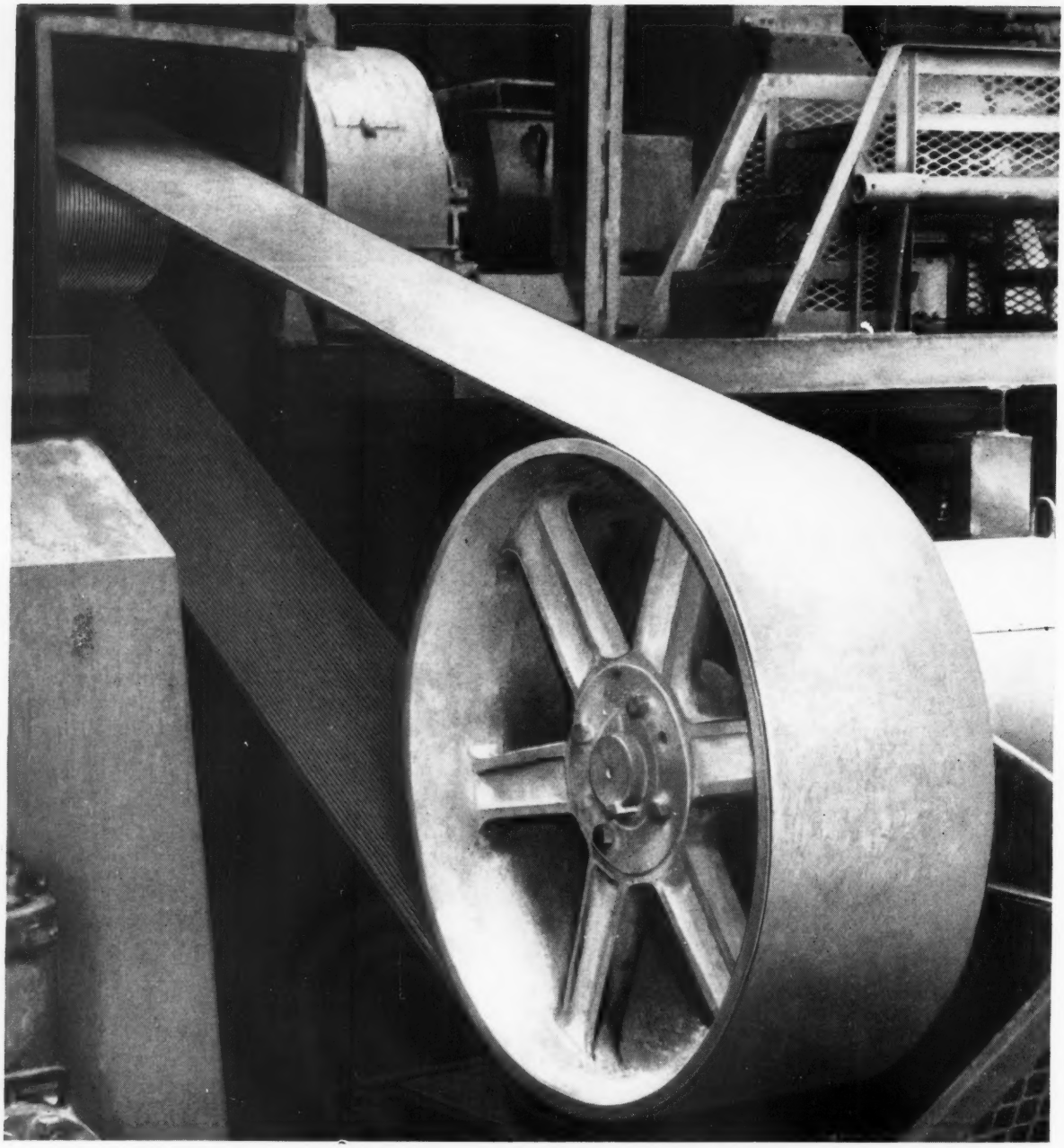

A GRIPPING SITUATION – This unique, multi-ribbed Poly V® Belt drives a 900 HP oil field pump for a West Texas drilling rig. Manufactured by Raybestos-Manhattan, Inc., its single-unit construction eliminates "matching" problems; provides excellent grip and positive tracking wherever heavy-duty power transmission is required. Because great lateral strength, crack-resistance and body are required in its manufacturing, Raybestos-Manhattan turned to Mount Vernon Mills, Inc. for a top cover fabric.

This is another example of how fabrics made by Mount Vernon Mills, Inc., and the industries they serve, are serving America. Mount Vernon Mills, Inc. engineers and its laboratory facilities are available to help you in the development of any new industrial fabric or in the application of those already available.

UNIFORMITY
Makes The Big
Difference
In Industrial Fabrics

Mount Vernon Mills, Inc.

A LEADER IN INDUSTRIAL TEXTILES

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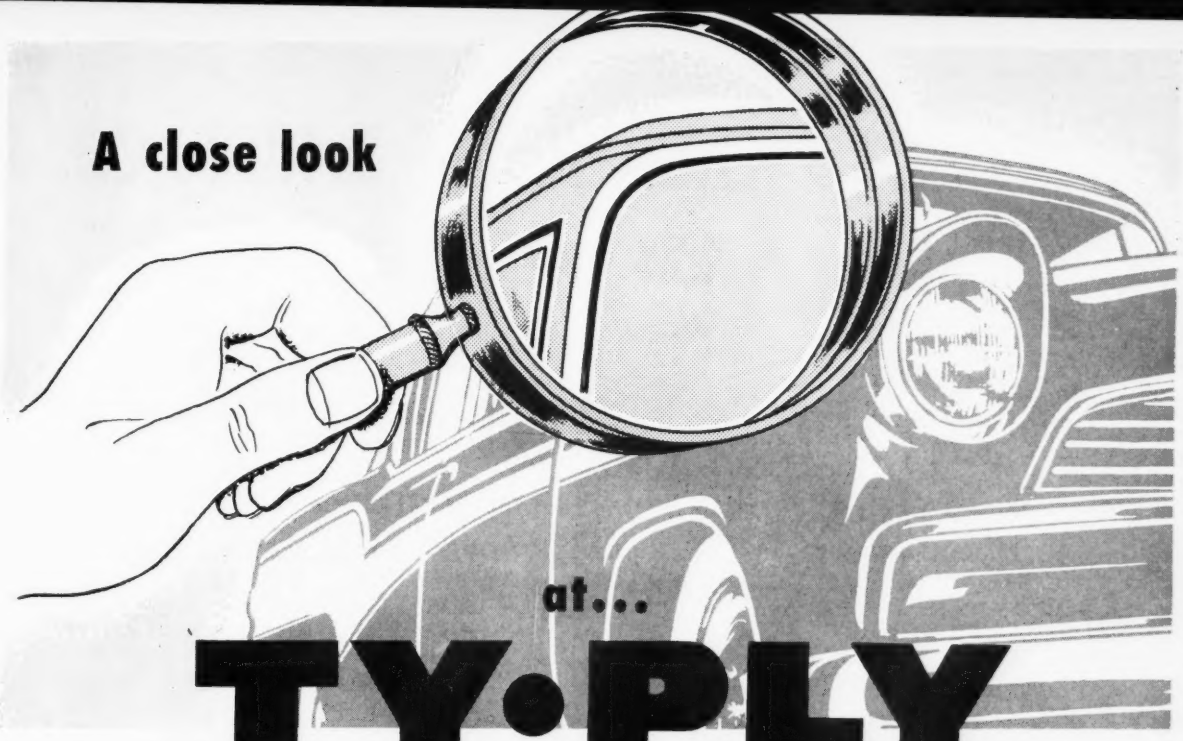


at...

TY·PLY®

UP-BC adhesive system

for perfect vulcanized bonding of Butyl rubbers to metals!

TY-PLY UP—the universal Primer, and TY-PLY BC, the Butyl Cover Cement, give exceptional bonds of Butyl compounds to metals regardless of cure system or type and amount of filler. TY-PLY BC alone is an excellent adhesive for the vulcanized bonding of cured and uncured Butyl rubbers to various types of elastomeric compounds.

TY-PLY "UP-RC"
two-coat Adhesive System for bonding Natural Rubber and GR-S Compounds.

TY-PLY "Q" or "3640"
the single coat Adhesive for bonding Natural and GR-S Compounds.

TY-PLY "BN"
for bonding N-types

TY-PLY "S"
for bonding Neoprene

TY-PLY will adhere most vulcanizable rubber compounds to almost any clean metal surface

Marbon®

MARBON CHEMICAL
Division of BORG-WARNER CORPORATION
GARY, INDIANA

TY-PLY has stood the test of time . . . since '39

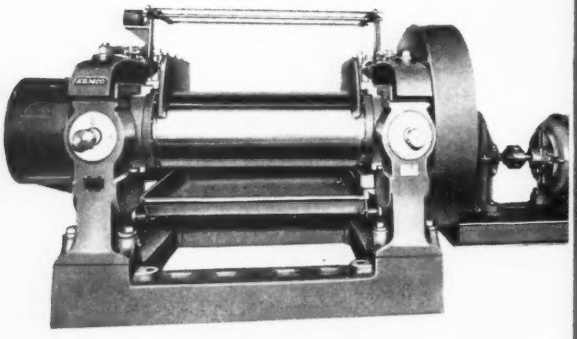
Consult ERIE ENGINE & MFG. CO.

for prices and delivery

MILLS • •

for the RUBBER and PLASTICS INDUSTRIES

EEMCO mills for mixing and compounding rubber and plastics are available in all sizes from laboratory mills up to and including 84" mills in standard or custom units.

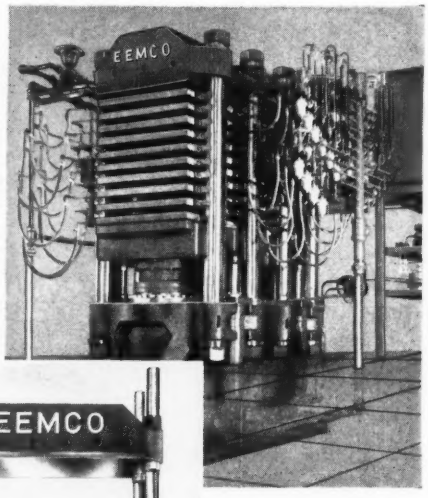


HYDRAULIC • • PRESSES

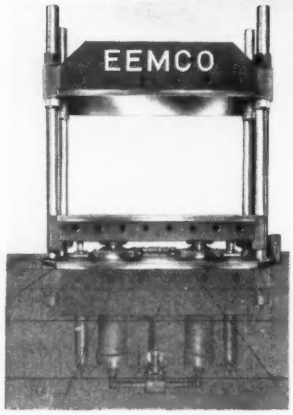
for RUBBER and PLASTICS PROCESSING

REINFORCED PLASTICS MOLDING

EEMCO heavy duty hydraulic presses are also available in a complete range of sizes from the 12" x 12" 42 ton laboratory press up to any size required. EEMCO designs and builds special presses to meet the customer's requirements.



EEMCO furnishes complete installations for reinforced plastics molding—presses, hydraulic units, preform machines, roving cutters and ovens.



Call or write us for complete details. We will be glad to discuss your "Mill and Press problems"—of course, at no obligation to yourself.

EEMCO **ERIE ENGINE & MFG. CO.**

12th STREET and EAST AVENUE • ERIE, PA.

MILLS • PRESSES • LOADERS • LIFT TABLES • PLATENS • PREFORM MACHINES • ROVING CUTTERS

I HAVE GONE THIS WAY

I HAVE NOT GONE FAR

I HAVE GONE FAR

I HAVE GONE SIX DAYS JOURNEY

THE FIRST MARKERS

It was three centuries before the white man finally completed an overland journey to the west coast of America. So vast was the continent, so great its forests and prairie expanses that travel was confined, in the main, to waterways, and in any event, to those areas near at hand.

The Indian had his methods of marking a trail. In his travels he sometimes bent saplings and, tying them down, indicated direction. The Indians of the plains often used the skulls of the buffalo to point toward their destination and with other markings left information they wanted others to know.

The Abnaki Indians used the ingenious method shown by the sticks and twigs in the illustration, thereby leaving a quickly deciphered sign as to their whereabouts. The white man adopted many of the Indian sign methods as he traversed the tremendous length and breadth of the land. He broke twigs, as did the Indian, and he left his "blaze" along the way. Of necessity he traveled light, even his oxcart and horse-drawn wagon bearing but the most essential things for livelihood.

Man has progressed far, particularly on this continent, in his ability to transport himself and his products. The once vast, unmarked land, so slow and tedious to traverse, has been "blazed" in every direction with highways and roadways; and on them, with a speed and convenience never dreamed of, the rubber tire — reinforced with carbon black — transports the commerce of the day.

The modern tire's endurance, longevity and dependability testify to the ingenuity of its manufacturers and to the unfailing qualities that carbon black provides.

UNITED CARBON COMPANY, INC.

KOSMOS 50

Kosmos 50 is a fast extrusion (FEF) structure black with excellent combination of well balanced properties. It is **the** black for better processing.

Kosmos 50 is the ideal choice for better, smoother and more uniform control on size and dimensional stability of extrusions. It enhances appearance.

Kosmos 50 is a must for black extruded mechanicals. Its use in molded goods is extensive. It is preferred for sub-treads and carcass stocks, and in some grades of tread rubber (camelback).

Standardize on UNITED blacks for established quality and uniformity. They succeed where other blacks fail. Compounders know.

UNITED CARBON COMPANY, INC.

A subsidiary of United Carbon Company

CHARLESTON 27, WEST VIRGINIA

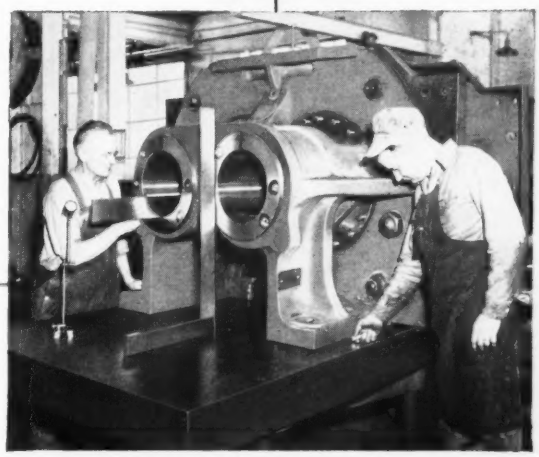
NEW YORK AKRON CHICAGO BOSTON MEMPHIS

EXPERIENCE

. . . is an invaluable ingredient in the S.C.S.* Method of Rebuilding BANBURY MIXERS

* S. C. S. means Skinner Certified Service The rebuilding of Banbury Mixers requires the skilled precision craftsmanship that is gained only through long years of experience. Veteran SKINNER craftsmen, who have been held to exacting tolerances in steam engines for decades, employ their skills in Banbury rebuilding. Approximately 30 per cent of SKINNER shop employees have been with the company for over 25 years, and more than 75 per cent for over 10 years. The combination of years devoted to precision workmanship; modern, efficient machine tools; and rigid testing and inspection are invaluable factors in Skinner Certified Service for Banbury Mixers.

SECO
ESTABLISHED 1868



Detailed Inspection Check of Body Alignment and Square Prior to Doweling.

A few POINTERS ON S. C. S.

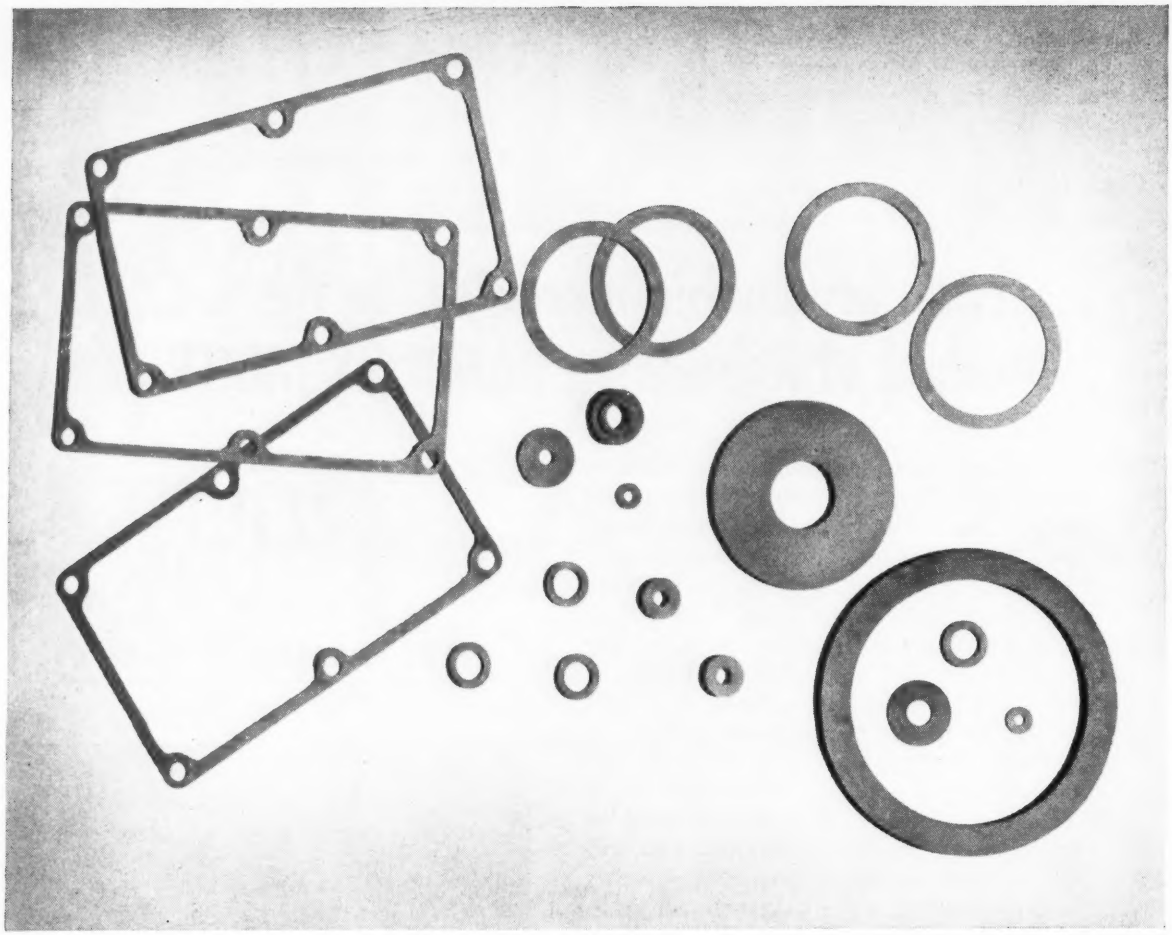
- All rebuildable parts of dismantled body are checked for hidden imperfections, for standard dimensions and distortion.
- Sides are bored out, and 2-in. liners of customer's choice installed.
- Rotors are completely stripped of hard-surfacing materials, and bodies rebuilt to proper contour. Entire rotor, inclusive of threads, is rebuilt, body hard surfaced, stress relieved, and restored to standard dimensions.
- Sliding door, dust seal rings, and body fit bolts are always provided new.
- All parts are carefully examined by skilled technicians and magnafluxed.

SKINNER · ENGINE · COMPANY

SECO
ESTABLISHED 1868

RUBBER MACHINERY DIVISION
TELEPHONE ERIE 2-3661

ERIE 6 · PENNSYLVANIA



SEALS OR GASKETS—Products that must display outstanding resistance to compression set, perform better when Hercules Di-Cup—the new "cure-all" for polymers—is used as the curing agent.

DI-CUP* FOR TOP RESISTANCE TO COMPRESSION SET

Wherever low compression set, good aging, and good low-temperature properties are required, versatile new Hercules Di-cup (dicumyl peroxide) is the ideal curing agent.

Seals and gaskets, however, are only one of the many categories of products for which this nonsulfur vulcanizing agent has an indicated usefulness.

By producing carbon-to-carbon cross linking, Di-cup can be used to advantage as a curing agent in natural rubber, GR-S, Buna N, silicones, polyethylene and many other polymers.

Economical to use, Di-cup is a stable peroxide of low volatility. In addition to producing vulcanizates having low compression set, good aging, and resistance to solvents and oils, Di-cup enables you to produce whiter white stocks which have good color retention. Silicones in thick cross section cured with Di-cup are free of gas bubbles and acidic by-products.

To learn more about this nonsulfur curing agent, write to Hercules. We'll be glad to send you technical data and information on currently available commercial forms.

** Hercules trademark*

Oxychemicals Division, Naval Stores Department

HERCULES POWDER COMPANY

INCORPORATED

914 Market St., Wilmington 99, Del.

N056-2

California Gold
Discovered in 1848 . . . and one of the West's most important products ever since. Specimen is gold-bearing quartz.

SYNTHETIC RUBBER

is a product of the West, too!

A GOOD THING to remember next time you need rubber—

The Shell Chemical plant at Torrance, California, is one of the nation's best equipped for production of butadiene-styrene types of synthetic rubber. Convenient location and diversity of product make Shell Chemical your logical source in the West.

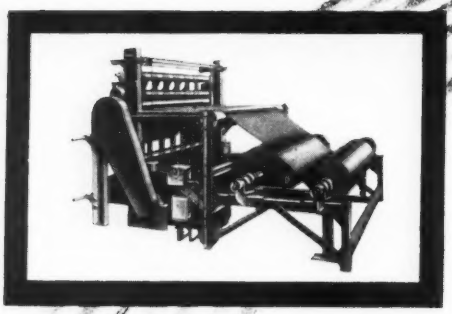
Whether you need rubber for sheeting, molded goods, extruded goods, tires or other uses—check with Shell, your convenient source. When you encounter troublesome technical problems, the Shell Technical Service Laboratory will help you find practical solutions.

Write or call *Torrance, California,* whenever you have synthetic rubber in mind!

SHELL CHEMICAL CORPORATION

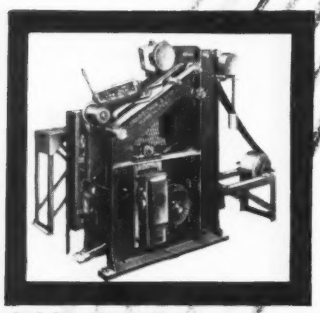
Synthetic Rubber Sales Division
P. O. Box 216, Torrance, California

SHELL

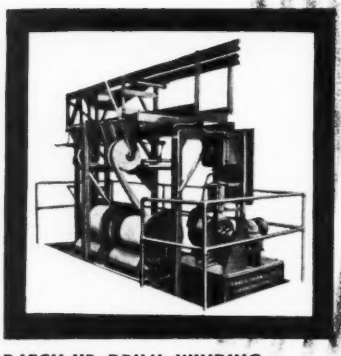


FABRIC SLITTING
at 450 yards an hour

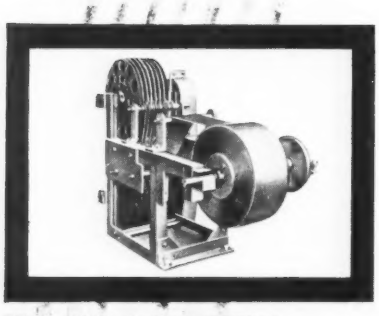
complete wire-bead CYCLE TYRES in one fast operation



SPOOL WRAPPING
to supply 4 Monoband machines

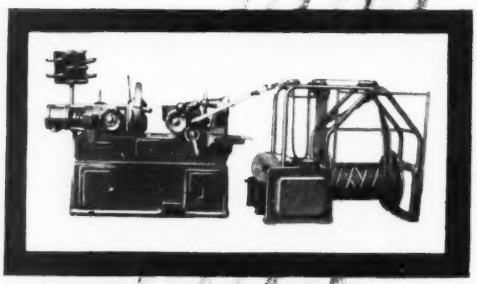


BATCH-UP DRUM WINDING
for continuous production

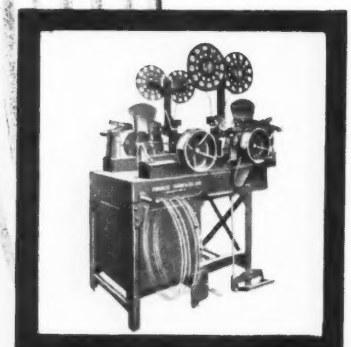


BEAD WIRE FABRIC SLITTING
for 1,650 tyres an hour

SHAW MONOBAND PROCESS



and **MONOBAND COVER PRODUCTION**
of up to 80 covers an hour

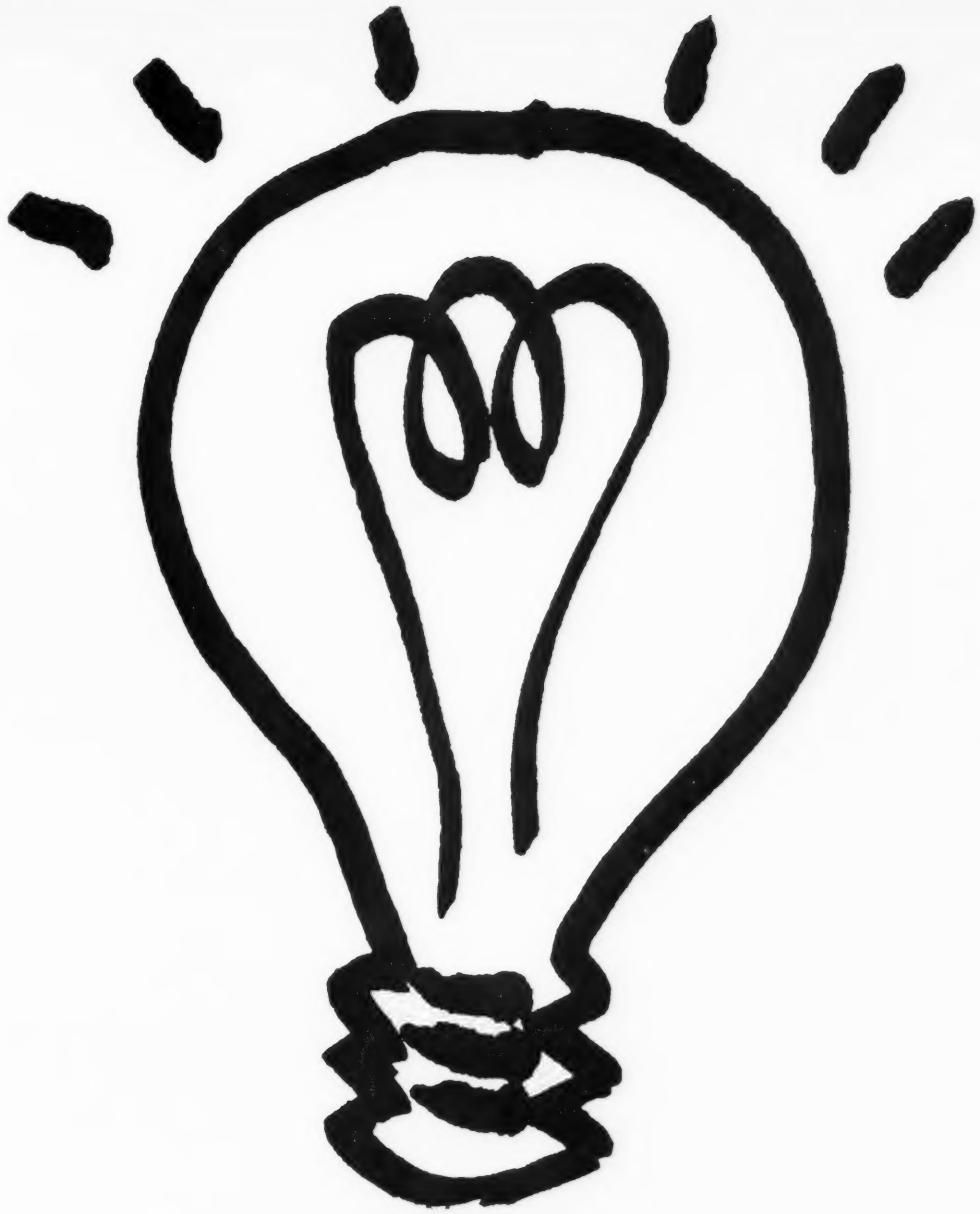


BEAD WIRE COVERING
of 300 single wires an hour

with the SHAW-SUMMIT vulcanising press

SHAW

FRANCIS SHAW & CO LTD MANCHESTER 11 ENGLAND
TELEX 66-357
Enquiries to:
FRANCIS SHAW (CANADA) LTD GRAHAMS LANE BURLINGTON ONTARIO CANADA
TELEPHONE NELSON 4-2250 TELEGRAMS CALENDER BURLINGTON ONTARIO



Helping You Develop Your Ideas For Rubber Formulation Is Our Business

New ideas can be the most practical, too. Formulations—like ideas—should change with the times. Like this idea that one rubber processor had that his tread stock could be improved.

The Problem: Produce GR-S HAF black tread stock with maximum resistance to ozone under dynamic and static conditions.

Here's What Monsanto Compounders Did: Compounded a GR-S 1500 HAF black tread stock with Santoflex* AW alone and in combination with Flectol* H, Santoflex DD and three other commercial antioxidants. The stocks were also checked after the addition of paraffin.

The Results: Without exception, a stock with 2 parts of Santoflex AW proved most practical under dynamic or static exposure tests both in the ozone test chamber and in outdoor exposure. Paraffin was shown to add measurably to static ozone resistance without seriously harming the cracking under dynamic conditions.

Helping you get superior processing and product performance is the only way we can sell. So call upon 30 years of experience in helping *chemically* to make rubber processing more efficient, rubber products better. If you think your tonnage is too small for a special research project, don't hesitate to talk it over with Monsanto. Among the 18,000 or so special reports—the answer to your problem may already be at hand. Just call, wire, or write: *MONSANTO CHEMICAL CO., Rubber Chemicals Dept. RC-2 (Telephone: HEmlock 4-1921), Akron 2, Ohio.*

*Reg. U. S. Pat. Off.

Accelerators • For fast, slow, and regulated rates of safe cure.

Antioxidants • For maximum oxidation resistance.

Specialty Compounds • For special processing problems.

MONSANTO

Durez phenolic resins impart

HIGHER BONDING STRENGTH

...to Nitrile Rubber and Neoprene Solvent Cements

Durez does not formulate or manufacture adhesives, but serves those who use them by helping adhesive producers to make a better product.

Durez Phenolic Resins enable you to produce solvent-type adhesives having superior bonding strength. They are most effective as modifiers in nitrile rubber and Neoprene cements.

Those we recommend for nitrile have very good compatability and reactivity with the rubber, and the degree of film reinforcement, hardness, and flexibility can be closely controlled by varying the amount of the resin.

You can get ample film strength for most purposes with room temperature curing. When exceptionally high strength and greater heat resistance are needed, curing at temperatures of 250°F. or higher gives notable results.

In Neoprene solvent cements, a resin strengthens the film and provides a means of controlling the solvent release to produce the tack properties desired for specific applications. Cements of this type have good adhesion to a wide variety of surfaces including glass, steel and other metals, nylon, oak, and pine.

It will pay you to investigate the advantages of modifying your cements with Durez phenolic resins. As a starter, let us send you the latest edition of our bulletin on Resins for the Rubber Industry.

DUREZ®

Phenolic Resins that fit the job

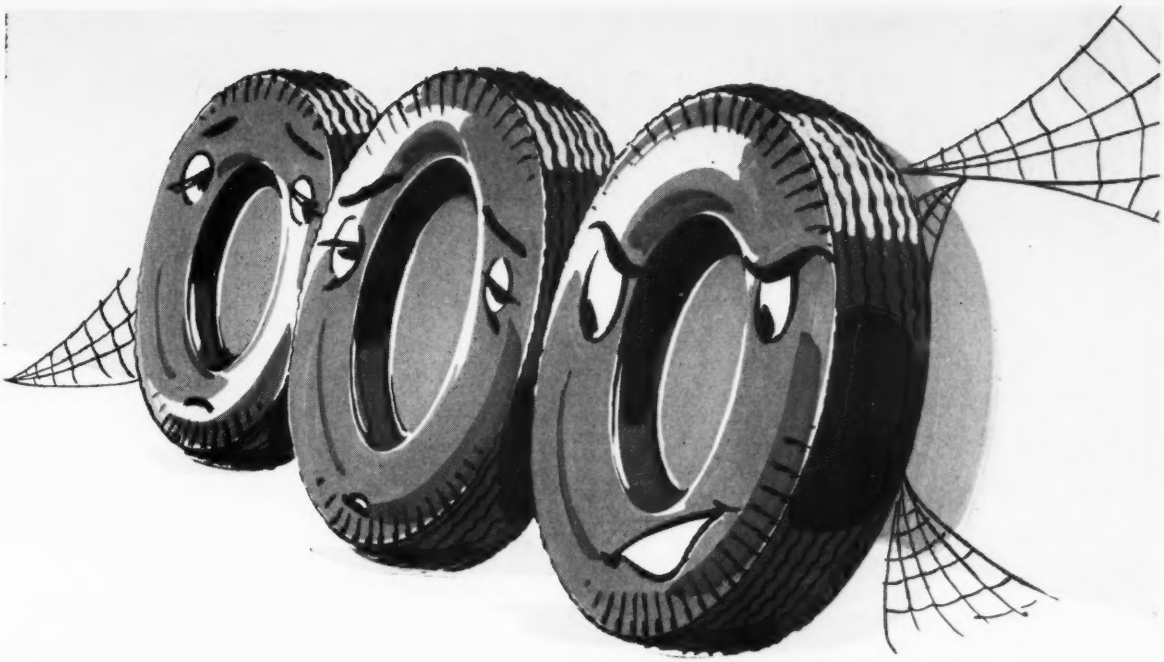
DUREZ PLASTICS DIVISION

HOOKER ELECTROCHEMICAL COMPANY

206 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICALS PLASTICS

Export Agent: Omni Products Corp., 460 Fourth Avenue, New York 16, New York



"Awright, Let's Get Crackin!"

Tires, or any other rubber products, unless effectively protected are subject to ozone attack.

Protection from ozone cracking is reliable and economical with Universal's high potency rubber antiozidants, the new UOP 288 and the widely-used 88.

These Universal antiozidants are heat stable, of finest purity, provide controlled uniformity and offer complete protection under both static and dynamic exposure.

Whatever your product, from tires to hot water bottles, if it contains rubber, either natural or synthetic, let us recommend the correct UOP antiozidant formulation which will provide complete protection from ozone cracking.

UOP 88® and 288 TRADEMARK
RUBBER ANTIOZIDANTS

PRODUCTS DEPARTMENT

UOP®

UNIVERSAL OIL PRODUCTS COMPANY

30 ALGONQUIN ROAD,
DES PLAINES, ILLINOIS, U. S. A.

In Your Latex Compounds . . .

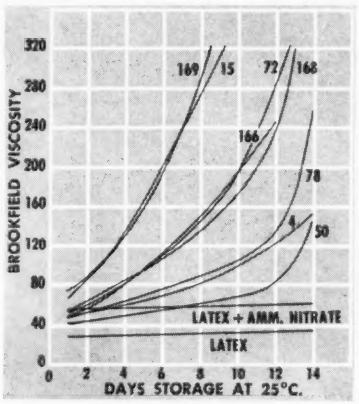
WHICH HORSE HEAD ZINC OXIDE DO YOU NEED?

Most formulators agree that zinc oxide is the most critical ingredient to select for latex use.

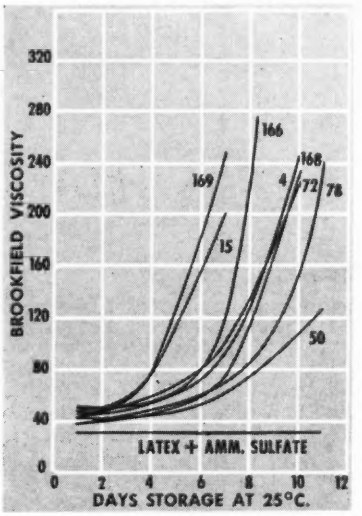
Here's why:

1. YOU can choose from many types of zinc oxides, and each type influences such important properties of latex compounds as viscosity, suspension, stability, rate of gelation and rate of cure.
2. YOU can't predict the influence of any type of zinc oxide on the properties of your latex compound . . . because the influence of a zinc oxide depends upon the specific latex formulation, as shown in the charts at right.

So . . . for best results, test the widest range of types—the Horse Head family—including the exclusive Kadox and Protox* brands.



Influence of zinc oxides on the chemical stability of latex containing 1% NH_4NO_3



Influence of zinc oxides on the chemical stability of latex containing 1% $(NH_4)_2SO_4$.

HORSE HEAD ZINC OXIDES FOR LATEX

Brand	Surface Area (Sq. M /Gm.)	Process of Mfg. American	Process of Mfg. French	Propionic Acid Surface Treatment
XX-50	3.0	✓		
XX-78	3.9		✓	
XX-4	4.4	✓		
Protox–166	4.4	✓		✓
Kadox–72	7.9		✓	
Protox–168	7.9		✓	✓
Kadox–15	10.0		✓	
Protox–169	10.0		✓	✓

*U. S. Patents 2,303,329 and 2,303,330

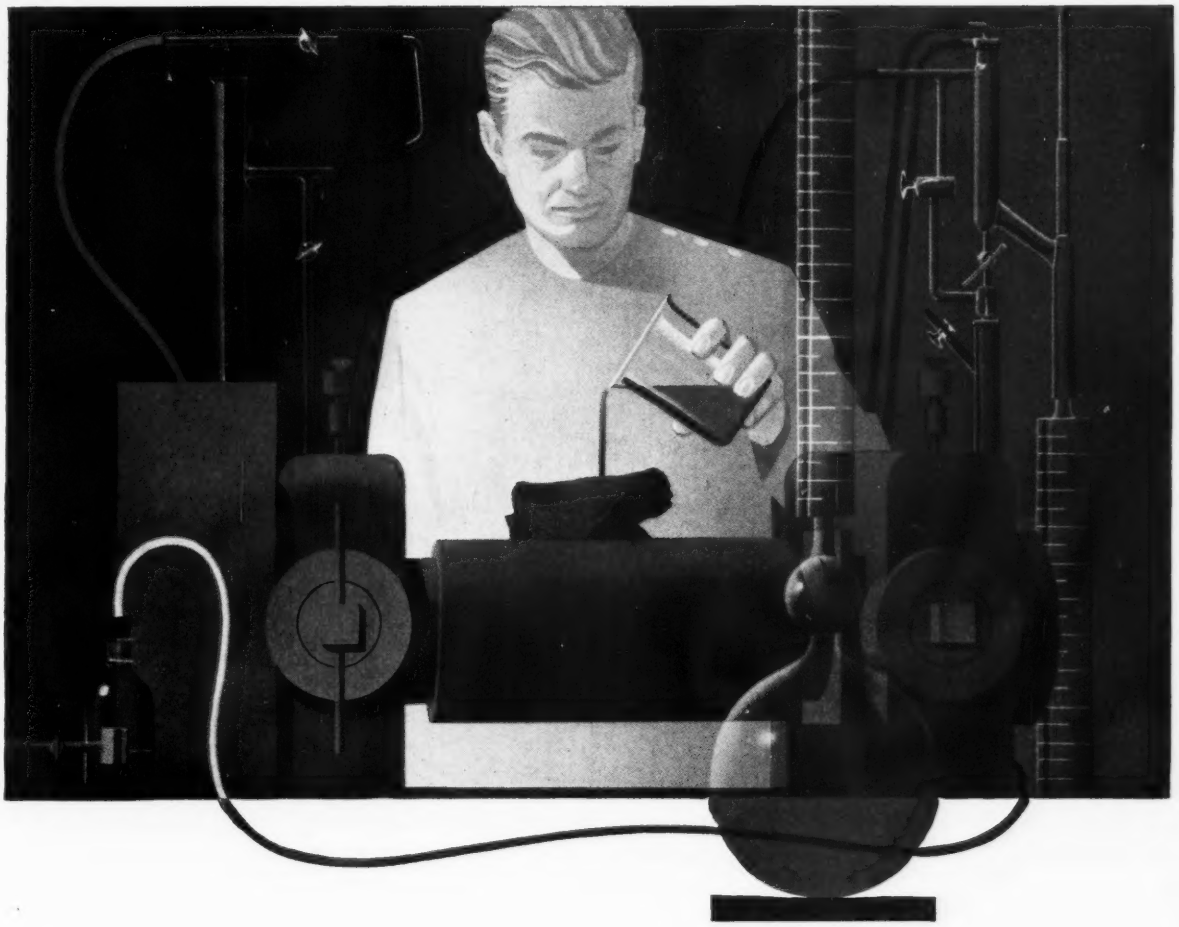
THE NEW JERSEY ZINC COMPANY

Producers of Horse Head Zinc Pigments

. . . most used by rubber manufacturers since 1852

160 Front Street, New York 38, N. Y.

HORSE HEAD PRODUCTS



Our Technical Service Laboratory Will Help You Build Better Products With Neville Resins

If you are not already using Neville coumarone-indene resins in the manufacture of your rubber products, it will pay you to request the assistance of our Technical Service Laboratory. Our chemists will work with yours in choosing the exact grade to suit your need. Neville coumarone-indene resins are ideal extender-plasticizers. They aid processing and add tensile strength and durability to finished compounds. Write for details.

Neville Chemical Company, Pittsburgh 25, Pa.

Resins—Coumarone-Indene, Heat Reactive, Phenol Modified Coumarone-Indene, Petroleum, Alkylated Phenol • **Oils**—Shingle Stain, Neutral, Plasticizing, Rubber Reclaiming • **Solvents**—2-50 W Hi-Flash, Wire Enamel Thinners.

NEVILLE

Please send information on Neville Chemicals.

NAME TITLE

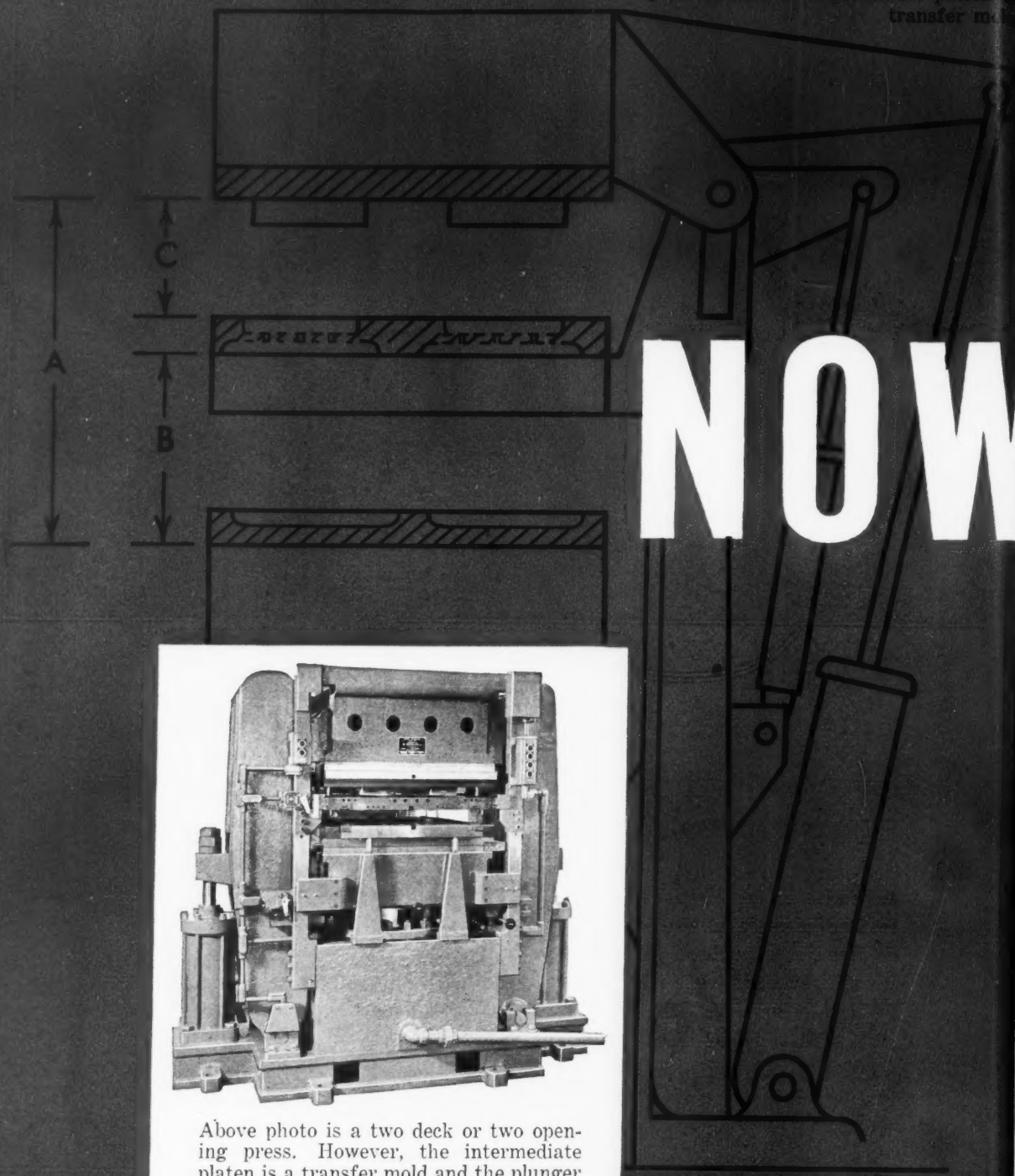
COMPANY

ADDRESS

CITY NC11-RW STATE

"A" can be adjusted to any requi
opening by setting limit of ram trave

"B" and "C" openings can be adjus
by movement of intermediate platen
transfer m



NOW

Above photo is a two deck or two opening press. However, the intermediate platen is a transfer mold and the plunger plate replaces the usual mold fastened to tilting head.

The tilting head design is not new. There are many tilting heads in operation with service records of 15-20 years. However, the two opening design is new.

ONLY THE MATERIAL MOVES IN AND OU

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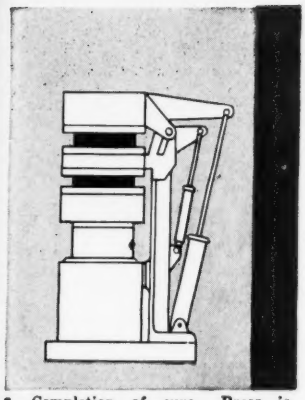
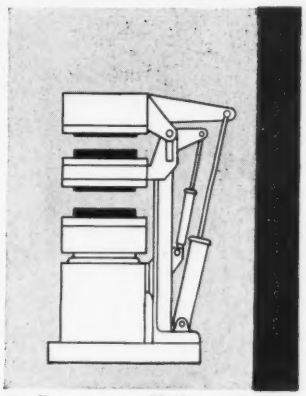
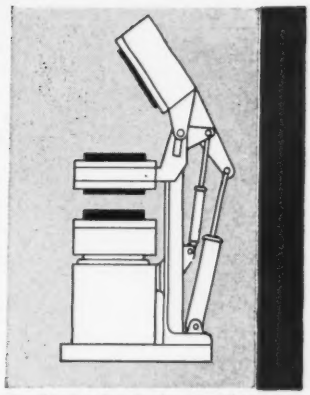


1. Completion of cure. Press is ready to open.

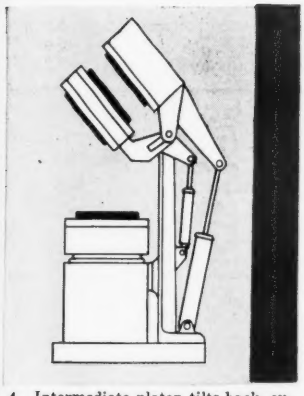


2. Press opens. Molds remain parallel during entire stroke of ram. This is necessary for deep cavity molds.

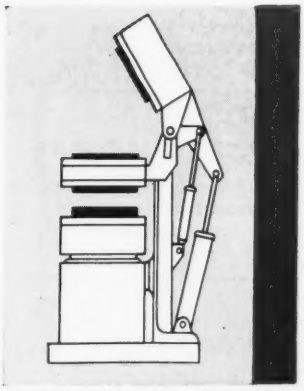


3. Head tilts back, exposing two halves of mold in top deck—cured articles are removed.

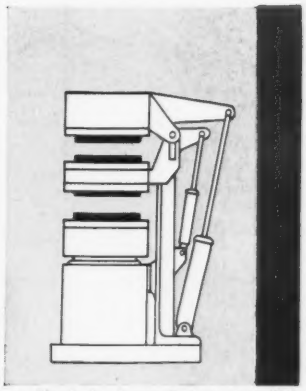
A TWO-OPENING TILTING HEAD PRESS



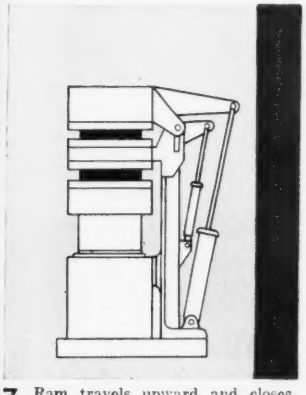
4. Intermediate platen tilts back, exposing two halves of mold in lower deck. Cured articles are removed. Fresh unvulcanized stock is placed in mold cavities.



5. Intermediate platen lowers into parallel position — unvulcanized stock is inserted in mold cavities.



6. Head is lowered into parallel position.



7. Ram travels upward and closes press. DIRECT AND FULL PRESSURE OF HYDRAULIC SYSTEM IS AVAILABLE THROUGHOUT ENTIRE STROKE OF RAM.

- Only the material moves in and out of the press. Molds remain in press, therefore mold halves **stay in register.**
- Cures two sets of molds at the same time.
- Timer, at prescribed intervals, automatically raises and lowers the ram, tilt head and intermediate platen.
- One operator, male or female, can attend to approximately as many presses as there are minutes in cure time. The operator simply removes cured articles and replaces with uncured, pre-formed stock.
- Press Sizes: 24-32-36"—up to 1,000-ton pressure.
- Two Opening Press can be used as a single opening press for extremely deep molds.

F THE TILTING HEAD

Sales and Engineering by

HALE and KULLGREN, INC.

P. O. Box 1231 · AKRON, OHIO

MANUFACTURED BY

THE AETNA-STANDARD ENGINEERING CO., PITTSBURGH, PA

PLANTS IN WARREN, OHIO · ELLWOOD CITY, PA

BURGESS COMPOUNDING MATERIALS

for Rubber and Synthetic Resin Compounds

USE BURGESS "ICEBERG" PIGMENT

- **For Vinyl Extrusion and Vinyl Floor Covering Compounds** "Iceberg" provides excellent base color as a white mineral loading, excellent resistance to alkalis and acids, high specific resistance with low moisture absorption properties.
- **For Butyl Wire and Insulating Compounds** "Iceberg" possesses excellent processing, reinforcing, and good electrical properties.
- **For Colored Butyl Inner Tubes, Drug Sundries and Mechanical Goods** "Iceberg" possesses excellent color, processing and curing properties and low moisture absorption.
- **For GR-S Compounding** "Iceberg" is useful in compounds requiring good white filler with good processing properties.

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- When finer particle size and reduced screen residue is desirable **"Icecap K" will give superior results.**

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- **For Vinyl Insulating and Electrical Compounds** No. 30 possesses excellent color and yields high insulation resistance values.

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- **For Natural and Synthetic Rubber Compounds** No. 20 yields level cures because of controlled pH. In natural rubber a small amount of "Iceberg" (approximately 20% of the filler content) will help prevent stickiness on the mill and also prevents die-plating of extrusion compounds.
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Write for technical data, working samples, and prices.

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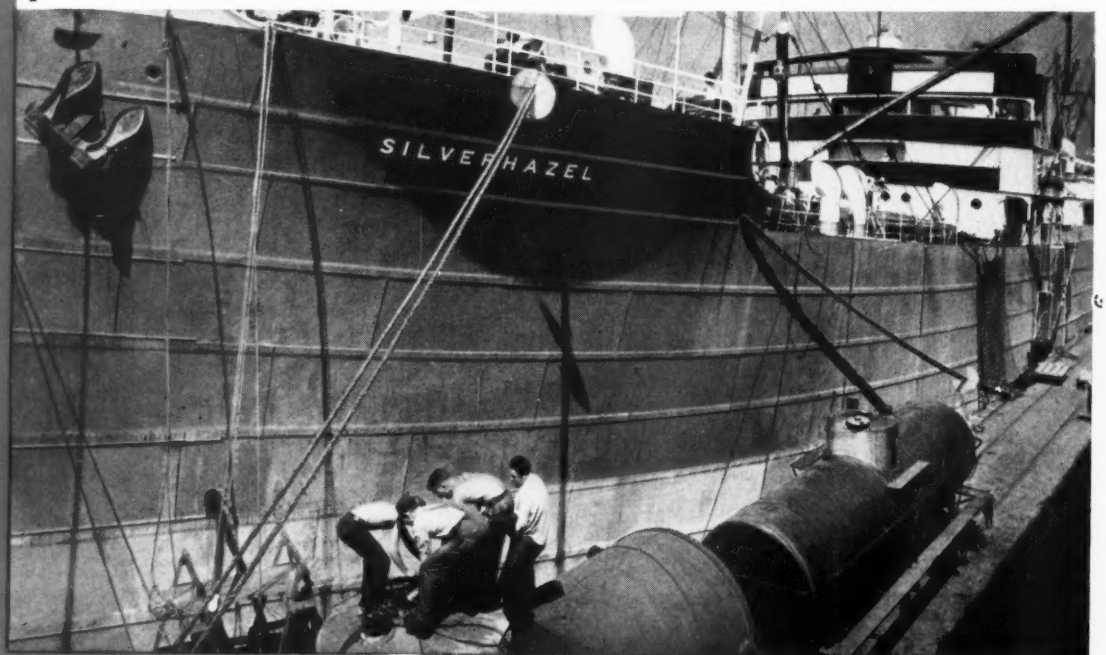
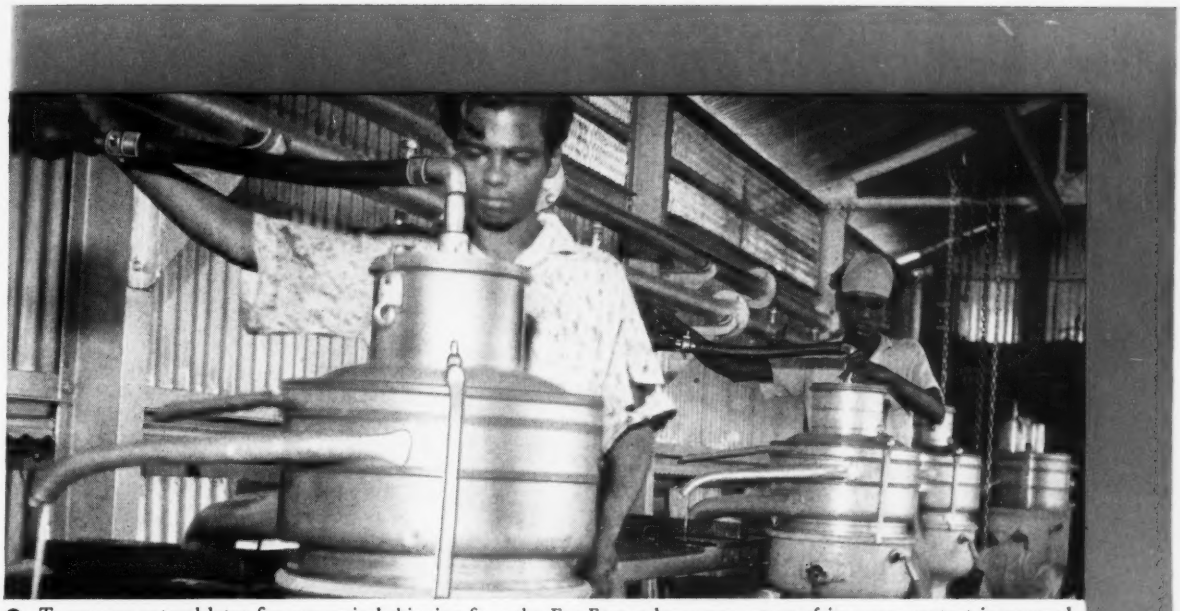
1 Flow of natural latex is started early in the morning by cutting away a one-fifteenth-inch strip of bark. To prevent spoilage, the latex is collected before noon of the same day.

2 Tank trucks speed latex from collection stations to the central processing plant, where laboratory tests are made and ammonia is added as a preservative during shipment.

It's Naugatuck for

4 From tanker to tank car, the concentrated latex starts the last leg of its journey to Naugatuck Chemical's strategically located compounding plants where it is again treated by experienced rubber chemists to prepare it for final application.





3 To prepare natural latex for economical shipping from the Far East, a large percentage of its water content is removed by creaming (skimming) or centrifuging. The centrifuges used are similar to cream separators in appearance and operation.

Latex...Natural or Synthetic!

Despite the increasing emphasis on Naugatuck's chemically-made rubber latices, don't forget that Naugatuck maintains a steady flow of natural Hevea latex from the United States Rubber Company's extensive plantations in Sumatra and Malaya... delivered to East and West Coast in ample supply.

The method of obtaining this milky white substance from the Hevea Brasiliensis tree is still rather primitive. But, from this point on, the science of rubber chemistry has taken over to insure purer, stronger and more uniform grades of natural rubber latex for foam rubber cushioning and mattresses, elastic yarns, tire cord dipping solutions, adhesive tape, wire insulation, dip molding and many other purposes for which natural latex may be preferred.

Naugatuck offers Hevea latex of the finest quality in four basic types: creamed, low-ammonia cream, centrifuged and super centrifuged. It is shipped in 55-gallon drums or 10,000-gallon tank cars. For details, current prices and technical assistance, contact any of the plants or branches listed below.

United States Rubber

Naugatuck Chemical Division

Naugatuck, Connecticut

BRANCHES: Akron • Boston • Chicago • Memphis • New York • Phila. • Mfg.: Los Angeles • Gastonia • Naugatuck • CANADA: Naugatuck Chemicals, Elmira, Ont.
Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N. Y.

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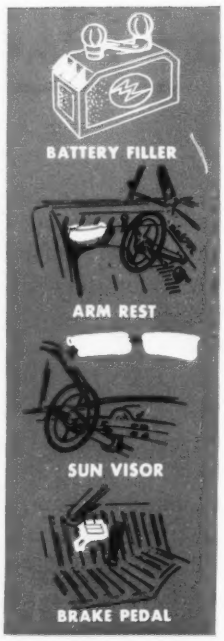

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In collaboration with other Societies, it aims to raise the standing of the Industry throughout the world by improving the technical qualifications of its personnel, extending the study of its raw materials, processes, and products, and by promoting the exchange of technical discovery and information by means of literature, conferences, and meetings.

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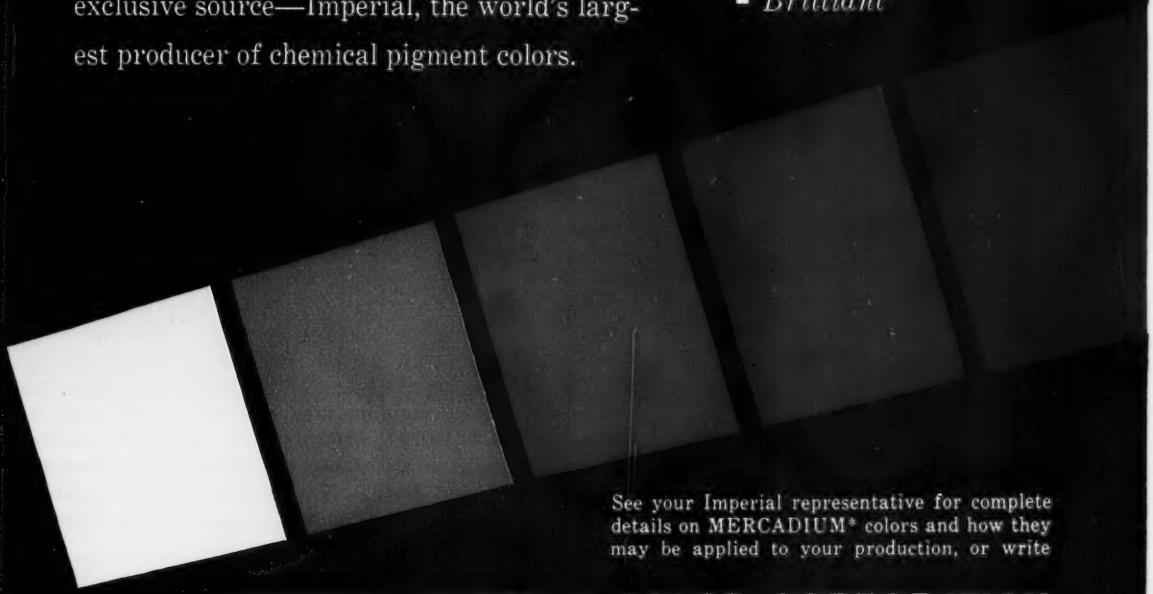

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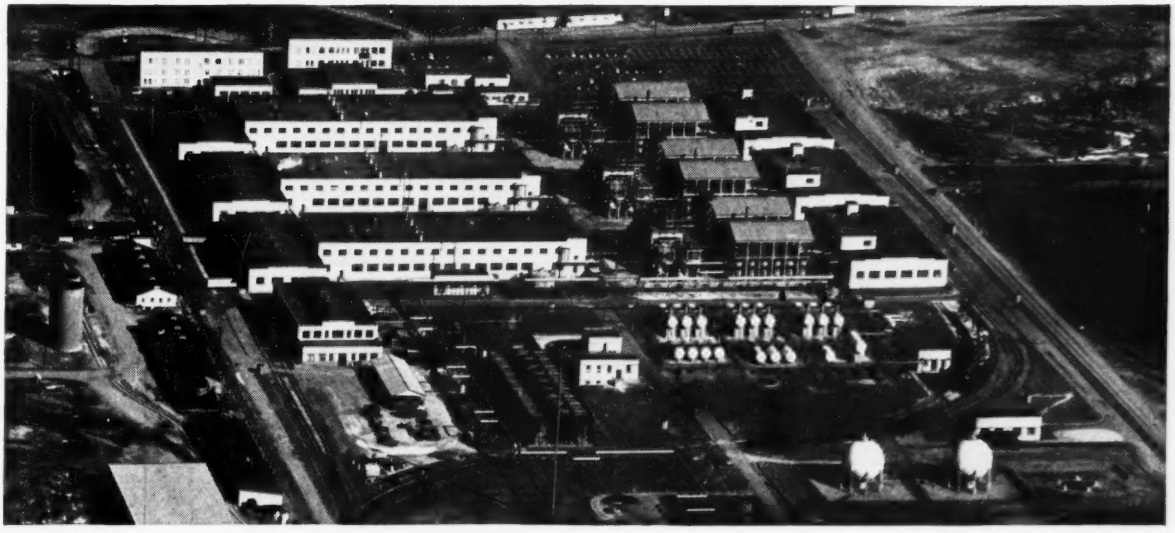

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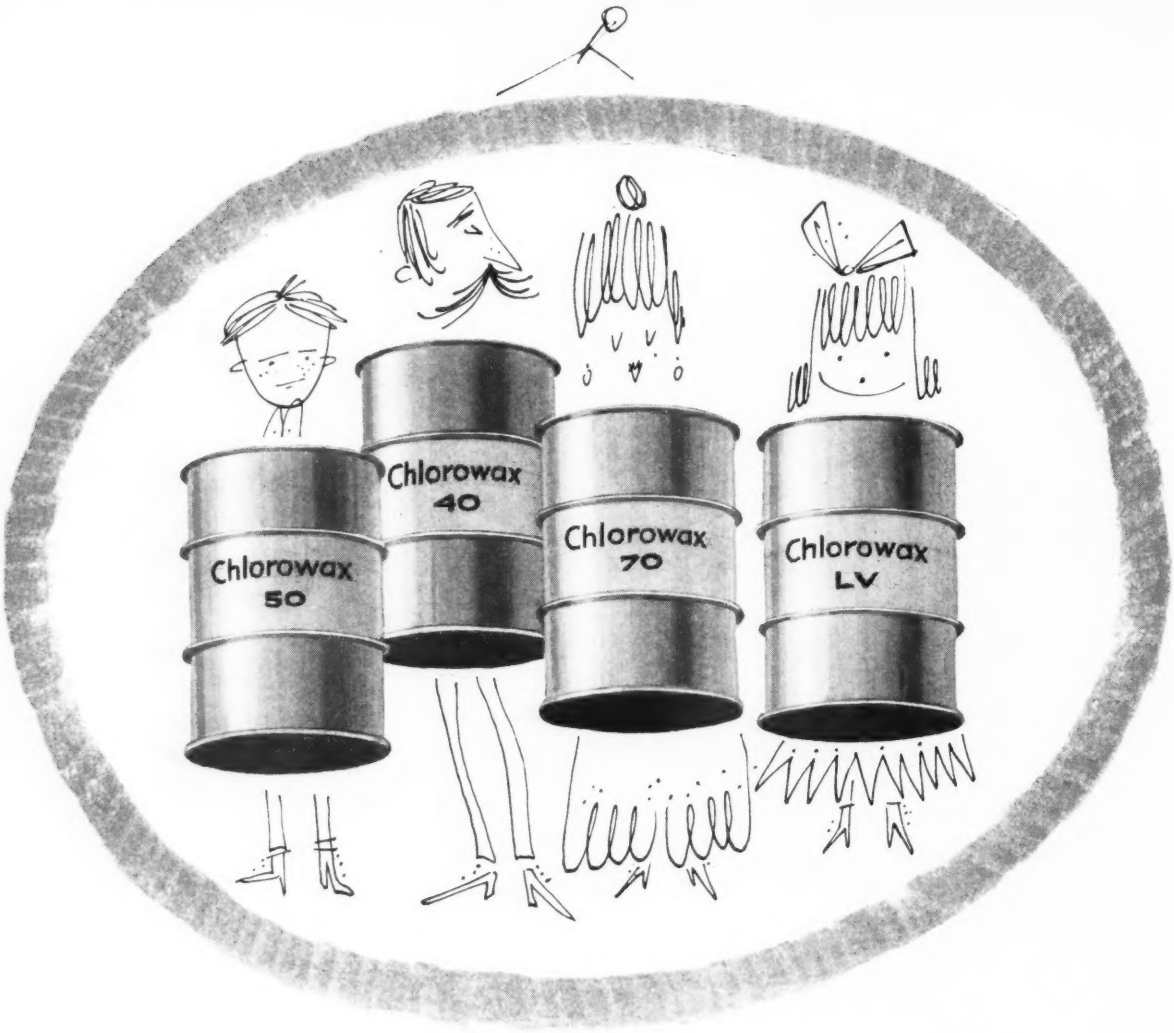

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CHLOROWAX 40 is similar to LV except for slightly higher viscosity.

CHLOROWAX 50 is a high-viscosity liquid for applications requiring lower volatility and flame retardance.

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For complete information, write to DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.

Typical Physical Characteristics

	Chlorowax 70	Chlorowax 50	Chlorowax 40	Chlorowax LV
Chlorine Content (%)	70	50	40	40
Viscosity (Gardner-Holt poises)	solid	125.0	25	5.0
Specific Gravity	1.65	1.26	1.15	1.13
Weight (lbs. per gal.)	13.7	10.5	9.6	9.4

All liquid or resinous forms of Chlorowax are odorless, nonflammable, nontoxic and insoluble in water.

DIAMOND CHEMICALS

Diamond Chemicals

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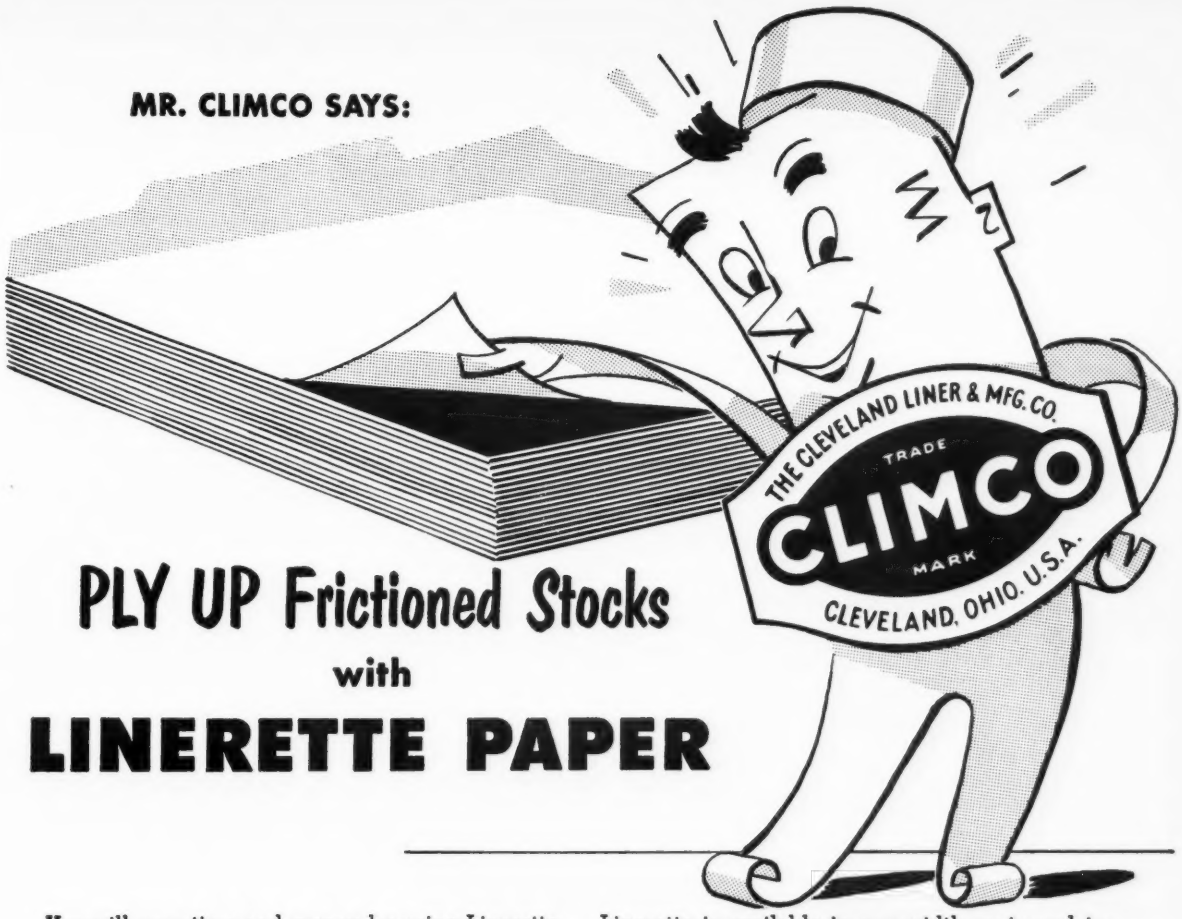

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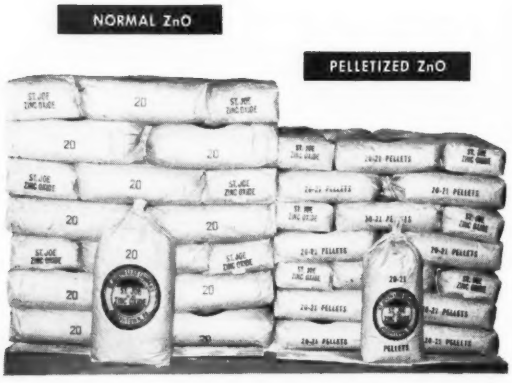

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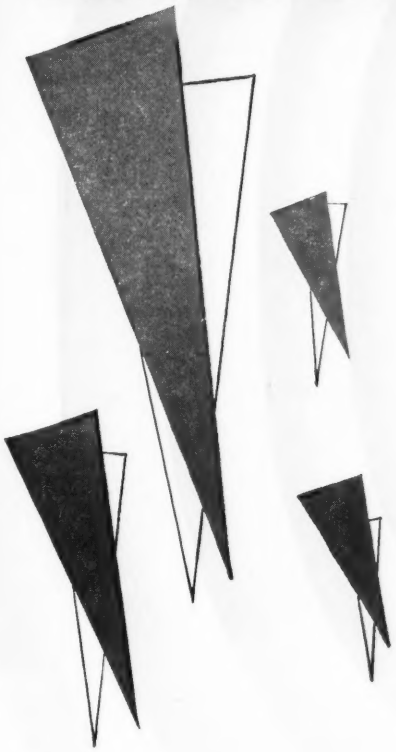

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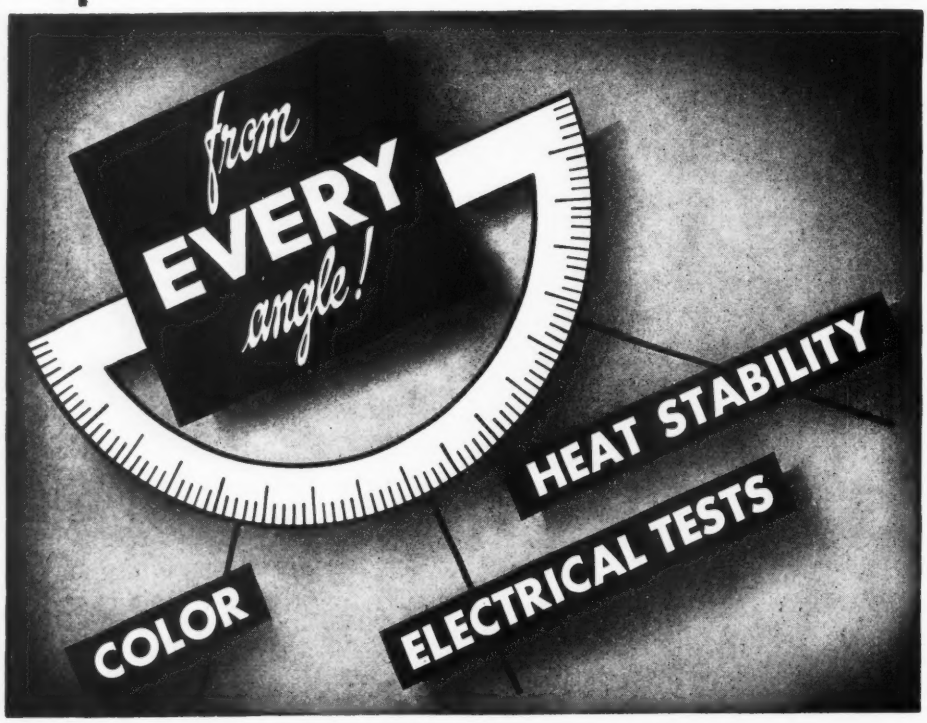

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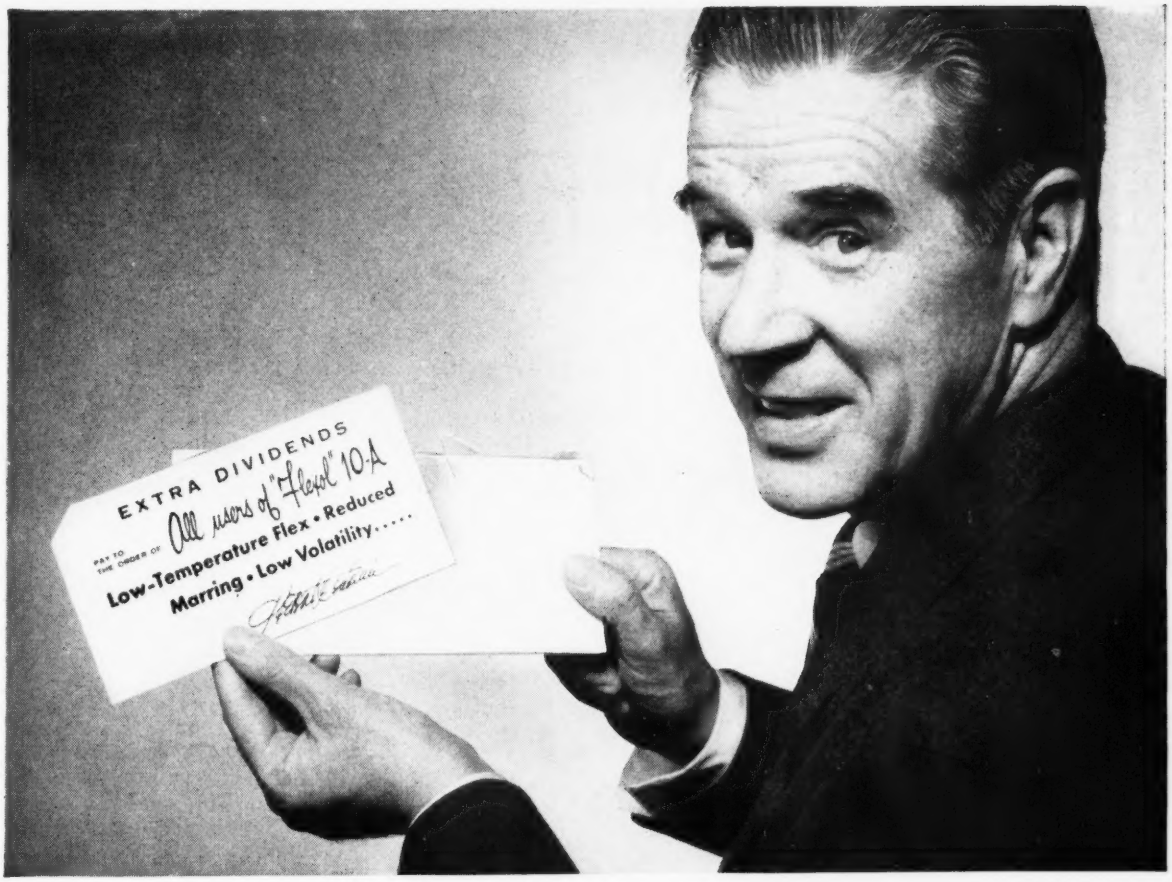

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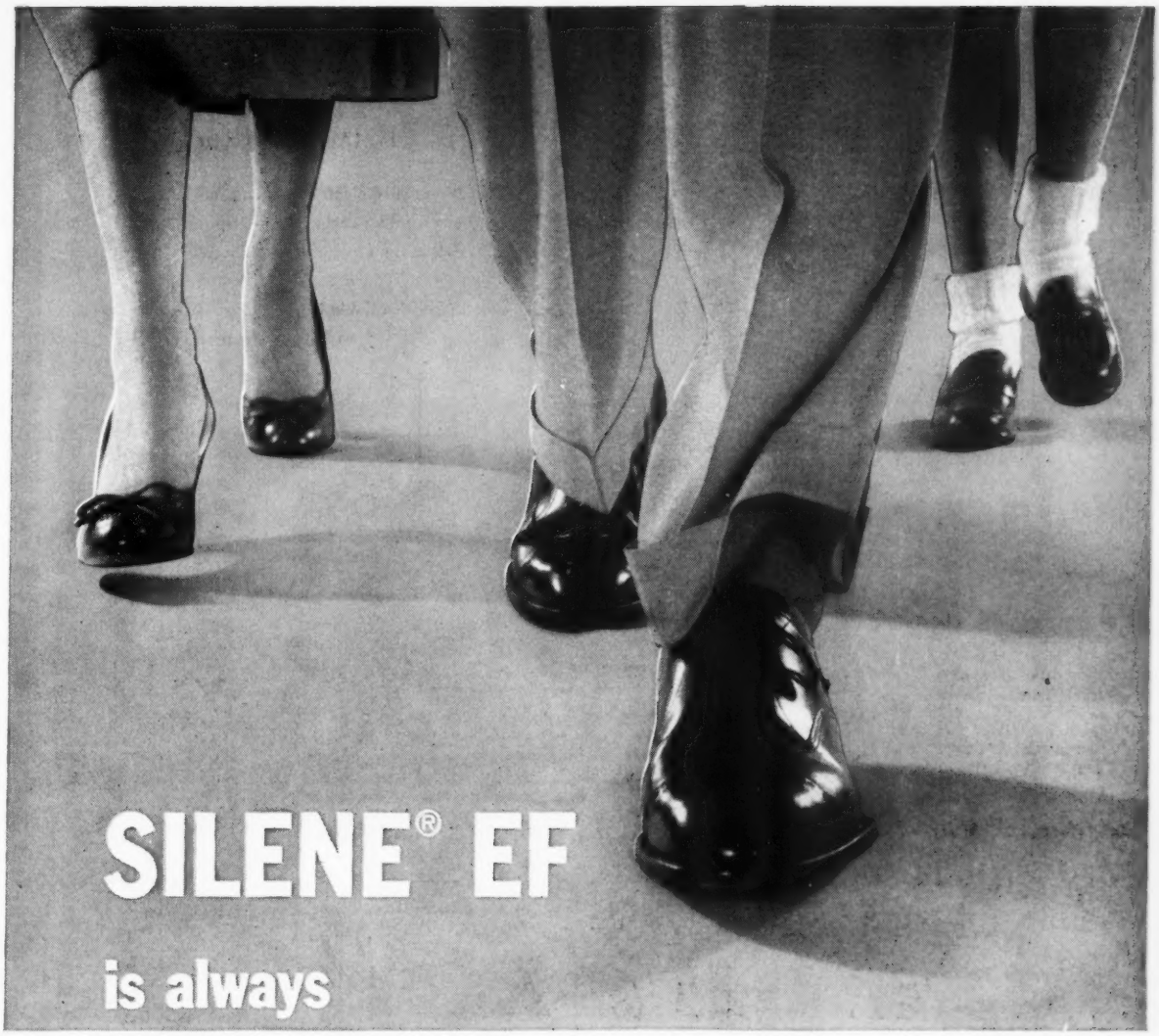

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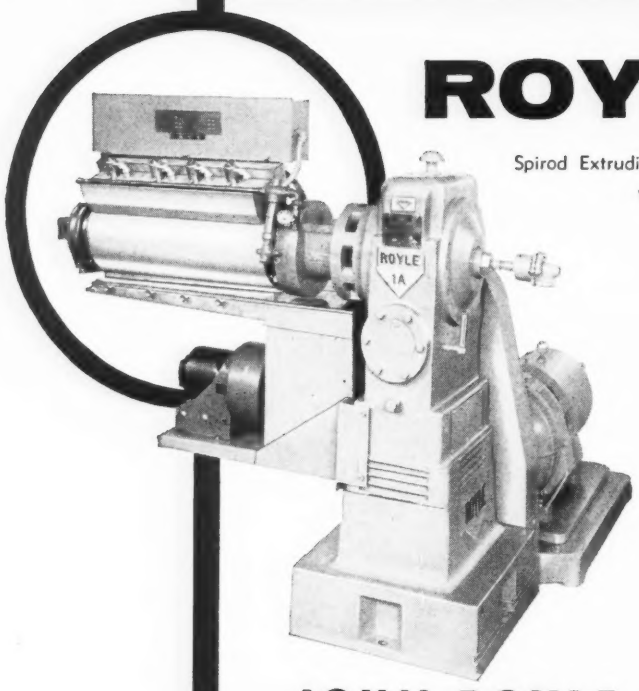

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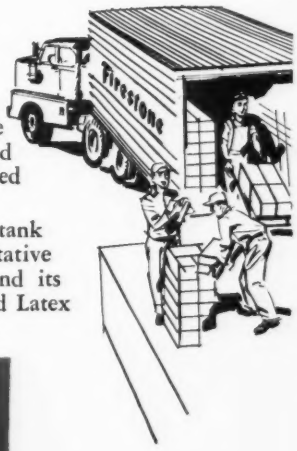

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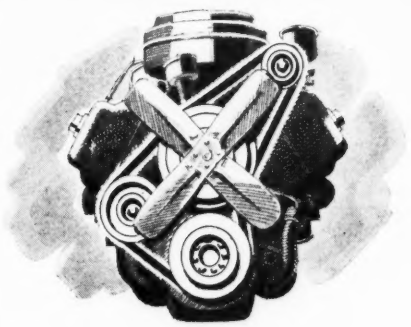
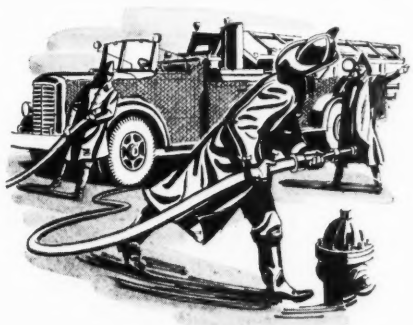
FORTISAN* 36 RAYON FIBER
makes these products STRONGER



V-BELTS. These vital power transmitters gain extra life when reinforced with Celanese FORTISAN-36. After extra long wear stretch is negligible. It won't expand or contract under normal V-Belt operating conditions so as to affect the belt's efficiency. This is because it's dimensionally stable. FORTISAN-36 is far stronger than conventional fibers, imparts higher tensile strength. That's why V-belts with FORTISAN-36 are now being used as original equipment on automatic washers, power mowers, trucks, passenger cars and farm tractors.



HIGH-PRESSURE FIRE HOSE. Used as filler cord in interior and exterior jackets of high-pressure fire hose, FORTISAN-36 pays off in a lighter but stronger hose that's more flexible, easier to handle and rack, and more heat-resistant. Also, it saves space because it folds tighter. FORTISAN-36 saves money in processing since it need not be heat-stretched.

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FORTISAN-36 IS GOING PLACES! Besides these applications, this new Celanese high-tenacity, heavy-duty rayon of saponified acetate has practical application for truck tires, plastic laminates, filters, paper reinforcement, tarpaulins and webbing. Let us show you how it can improve your product. Write for booklet TD20A to Celanese Corporation of America, Industrial Sales Dept., Textile Division, Charlotte, N. C. Branch offices: 180 Madison Ave., N. Y. 16; Pilgrim Sq. Building, 9 Overwood Rd. at W. Market St., Akron 13, Ohio (Tel.: TE 6-2392). *Reg. U.S. Pat. Off.

Celanese

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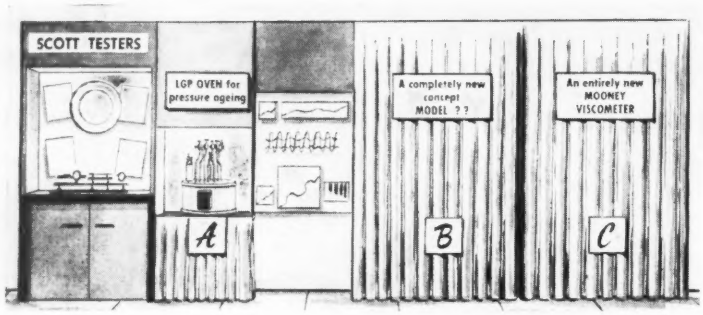
FORTISAN* RAYON · FORTISAN*-36 RAYON · ARNEL* TRIACETATE · ACETATE · VISCOSE-RAYON



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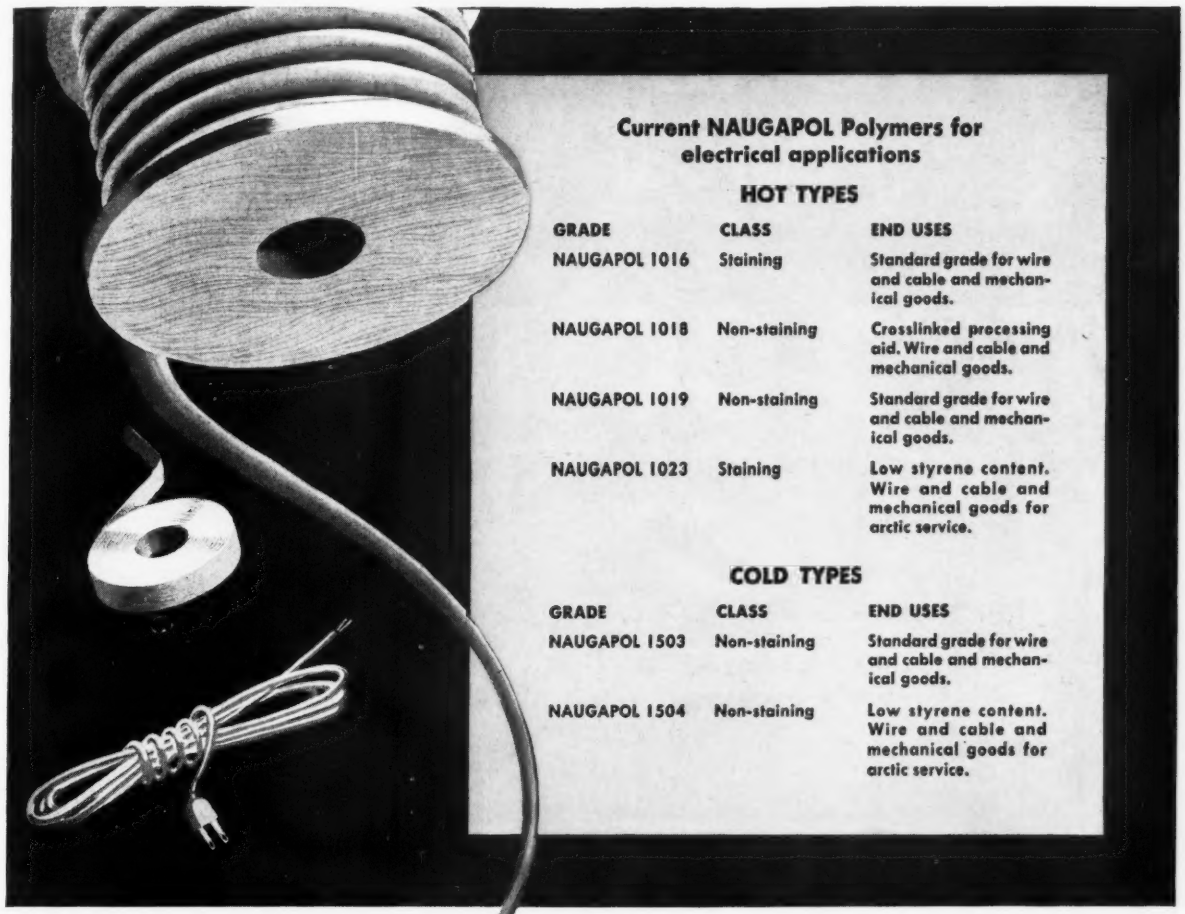

Current NAUGAPOL Polymers for electrical applications

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GRADE	CLASS	END USES
NAUGAPOL 1016	Staining	Standard grade for wire and cable and mechanical goods.
NAUGAPOL 1018	Non-staining	Crosslinked processing aid. Wire and cable and mechanical goods.
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Division of United States Rubber Company
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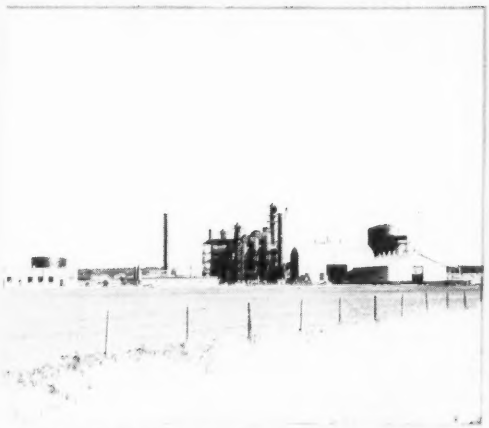
DYNAMIC GROWTH
in Carbon Blacks . . .
by
WITCO-CONTINENTAL

Active Center of Carbon Black Research is the WITCO-CONTINENTAL Laboratory at 1400 W. 10th Avenue, Amarillo, Texas.



Modern Production Facilities, such as this new plant at Ponca City, Oklahoma, enable WITCO-CONTINENTAL to produce a complete line of carbon blacks. Latest process controls assure rigorous uniformity of grades in all 5 WITCO-CONTINENTAL plants.

New
Bowery
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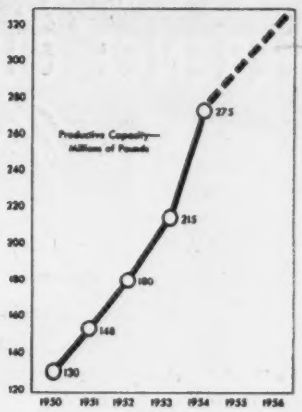

Production, research and technical service have shared in the dynamic, yet balanced, growth of WITCO-CONTINENTAL as a producer of carbon blacks.

As our production grows, we are continually expanding our services to provide rubber manufacturers with every benefit of modern carbon black technology.

Call on WITCO-CONTINENTAL for prompt sales and technical service in carbon blacks.

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Continex SRF-NS — Non-Staining
Continex HMF — High Modulus
Continex HAF — High Abrasion
Continex FEF — Fast Extruding
Continex ISAF — Intermediate Super Abrasion
Continex CF — Conductive Furnace

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Continental A — (MPC) — Witco No. 1
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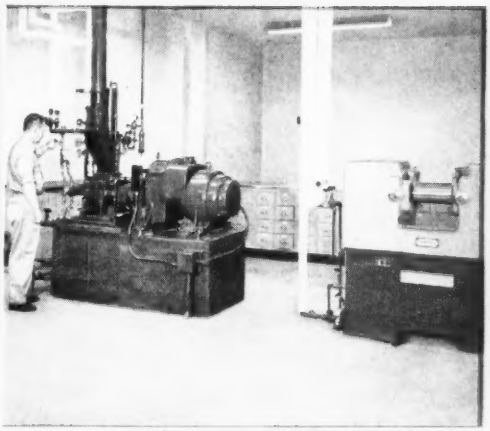

New Technical Service Laboratory at 213 West Bowery Street, Akron, is completely equipped to handle customers' formulation problems.

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It will solve many die cutting, flash trim and punching problems

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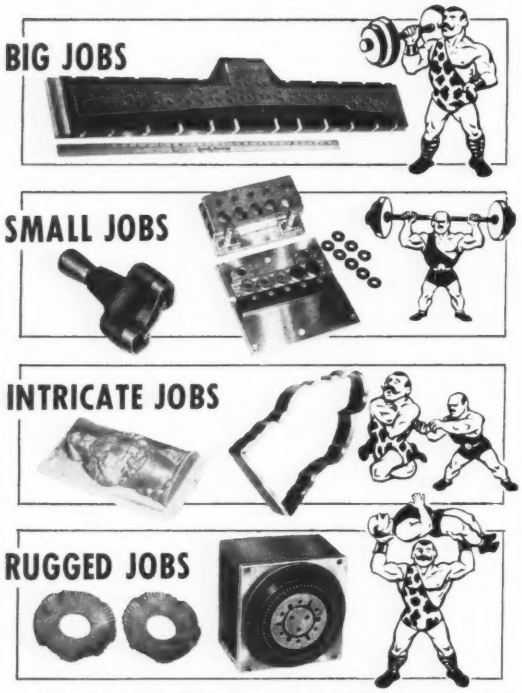

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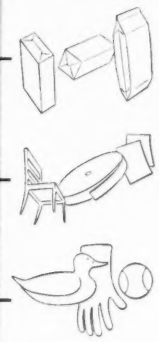
IS IT **coated?**

IS IT **heat sealed?**

IS IT **slush molded?**



THEN YOU SHOULD TALK WITH AN ARCCO ENGINEER

Unless you have talked with an ARCCO Engineer recently, you aren't up to date on the newest, most satisfactory and most economical

EMULSIONS
SOLUTIONS
HOT MELTS
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ARCCO offers you a complete compounding service. Standard ARCCO formulations cover a wide range of uses. Or, ARCCO will develop and compound modifications or special formulas tailored to your specific requirements. It will pay you to consult an ARCCO Engineer.

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Vinyl compounders –

you benefit by specifying plasticizers made from

Indoil

OXO ALCOHOLS

Here's how – You sell finished product by volume rather than by weight. You get the most volume at lowest cost by buying plasticizers on the basis of volume of finished product, not weight of finished product. At equal cost per pound Oxo Alcohol plasticizers such as DIOP and DDP are cheaper to use. Here is a comparison:

	DOP	DIOP	DDP
Density 20/4	0.983	0.983	0.963
EMC* at 1,600 psi	50.3	51.4	53.7

**Equivalent Modulus Concentration (phr)*

INDOIL plastics evaluation laboratory checks quality of INDOIL Alcohols by testing finished product. Here operator measures elongation of plasticized vinyl strip to determine Equivalent Modulus Concentration of plasticizer.

No need to reformulate—Compounders plasticizing with DOP need not refigure formulations in order to use DIOP or DDP. They can be modified by using this table:

Ratio $\frac{\text{Plasticizer phr}}{\text{DOP phr}}$		
	100% Elong. at 1,600 psi	100% Elong. at 900 psi
DOP	1.000	1.000
DIOP	1.022	1.019
DDP	1.068	1.086

Contact your supplier – Ask your plasticizer manufacturer for samples of DIOP, DDP and other esters made with INDOIL Oxo Alcohols. INDOIL Chemical Company does not manufacture esters.

Information – Send for INDOIL Bulletins Nos. 22 and 23.

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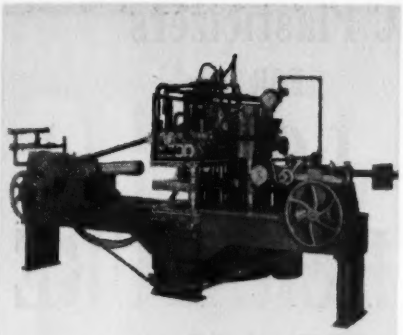
"MORE THAN A QUARTER OF A CENTURY EXPERIENCE"



Open Gap 47-Ton Belt Press for curing flat and V-type transmission belts. The moving platen is accurately machined from a rolled steel slab and is guided by long, full-round babbitted guides on the strain rods. Intermediate platen has drilled channels to provide two heating circuits, one for each surface. For information on this or other presses for the rubber, plastics, woodworking or metalworking industries, write us today.

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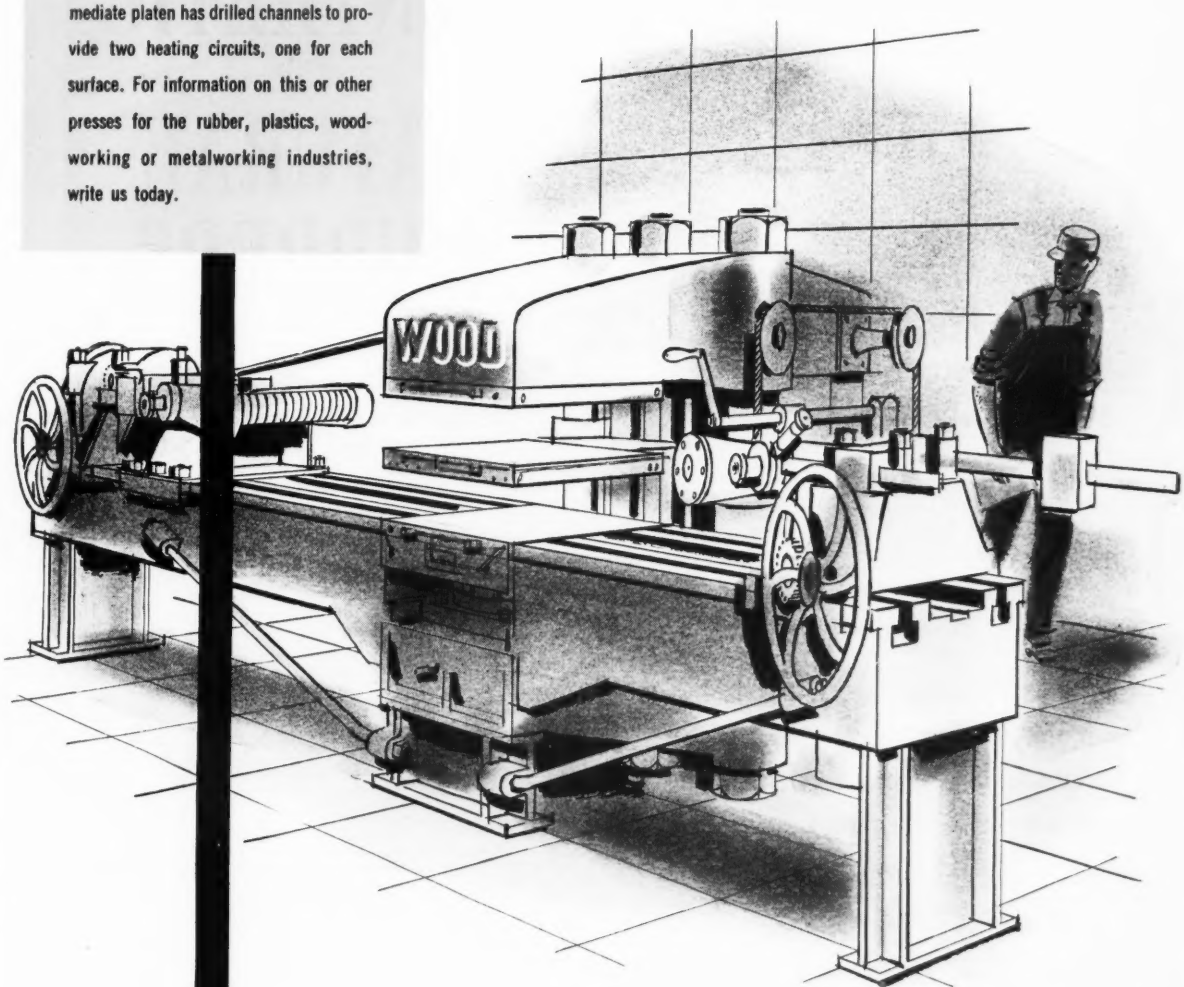
When an R. D. Wood press swings into action, gratifying things happen to production costs. For, in most cases, production climbs to a new high and down-time for repairs approaches zero. The reason is the smooth, dependable performance of R. D. Wood presses—even under difficult conditions. And the reasons for this superior performance are the exacting standards set by R. D. Wood—in design, selection of materials, and craftsmanship. If your company's theme is low-cost production, here is your prelude—ready made.



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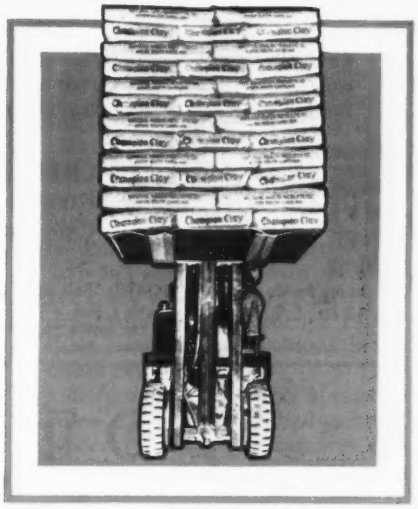

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✓ *It offers IMPROVEMENT in compounding results that assure better appearance and better quality in the finished products . . .*

CHAMPION gives you the electronic weight check on every bag . . . It gives you a compact, compressed unit (air-free) in every bag . . . It gives you the "ChamPak" unit pack on expendable pallets — a preformed unit that keeps the load solid in transit, reduces breakage and waste, but can be readily handled by fork truck.

Champion Clay is manufactured by National Kaolin Products Company. Write for complete data on compounding clays.

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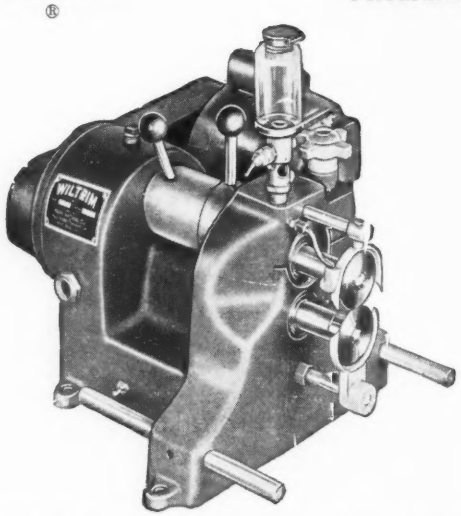
WILTRIM®
Model DF TRIMMER

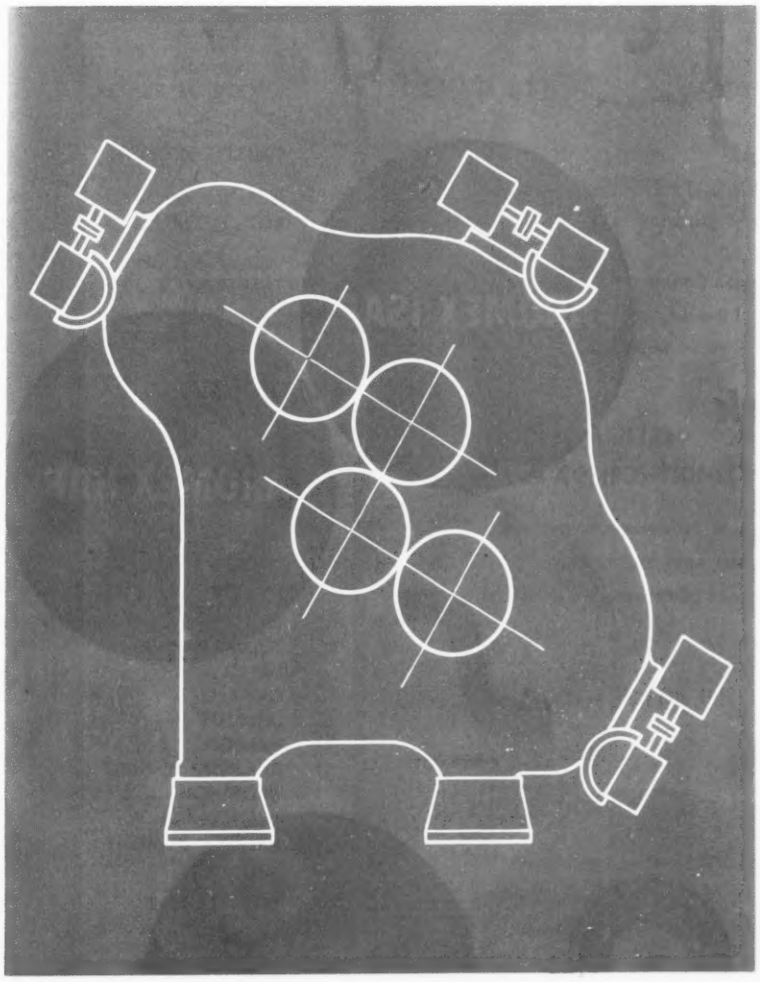


Wills thirty-nine years experience brings you this outstanding successor to the famous earlier Models D, DE and DM trimmers.

MACHINES ARE AVAILABLE FOR TRIAL

FERRY MACHINE COMPANY
WILLS RUBBER TRIMMING DIVISION
KENT, OHIO, U.S.A.
(Export Sales Through Binney & Smith, International)

NEW F-B inclined "Z" calender provides better accessibility for operation



Still another outstanding contribution to the efficient conversion of raw material to finished product is the Farrel-Birmingham four-roll *inclined "Z" calender.* It provides improved operating conditions while retaining the many recognized advantages of the original F-B "Z" calender design.

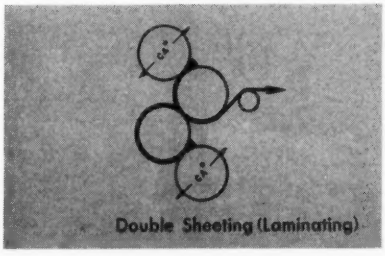
The angle of the rolls makes threading easier and facilitates access to the rolls for operation and for installation of auxiliary equipment.

Other advantages of this new calender include: (1) "Z" arrangement of the rolls isolates the separating forces. With only two rolls in any single plane, there is no pressure from a third roll to affect roll settings and cause fluctuations in gauge. (2) Motorized crossed axes device (single or double) provides widest range of "crown" adjustment with maximum accuracy of gauge. (3) Hydraulic pre-loading devices anchor rolls in their fixed loaded positions in precision bearings.

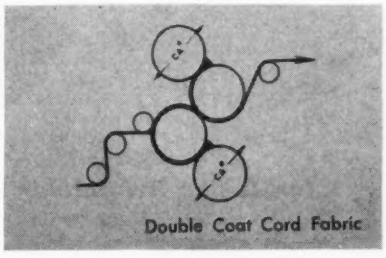
Before you decide on a calender, come to "Calender Headquarters," where the "Z" calender was originated and developed. In the meantime ask for details of the new F-B inclined "Z" calender.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

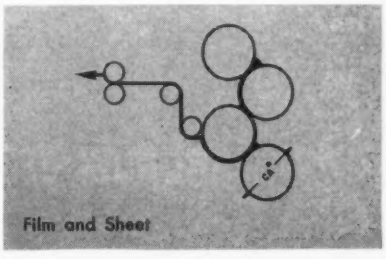
Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Fayetteville (N.C.), Los Angeles, Houston



Double Sheeting (Laminating)



Double Coat Cord Fabric



Film and Sheet

*CA=Crossed Axes

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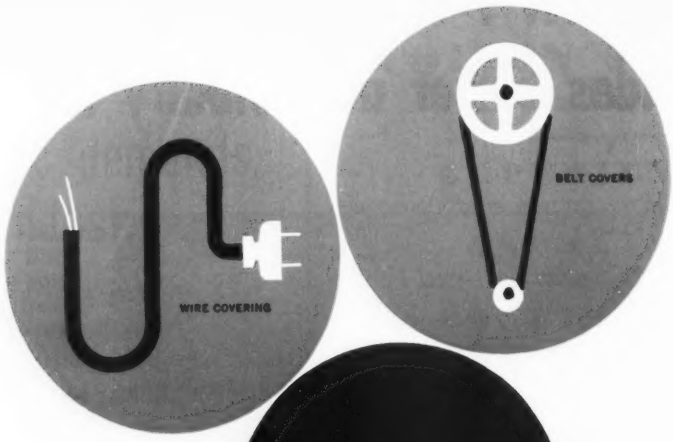

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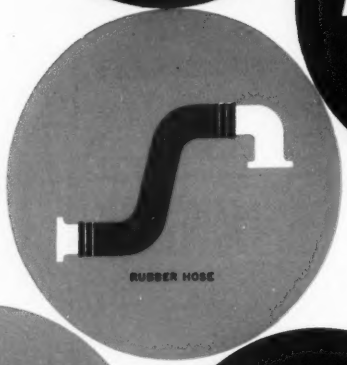

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United States, $5.00 per year; Canada, $6.00; all other countries, $7.00. Single copies in the U.S., 50¢; elsewhere, 60¢.

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RUBBER WORLD

JUNE, 1956

VOLUME 134, NUMBER 3

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Cover photo, background, courtesy of United States Rubber Co.; chart, RUBBER WORLD

published monthly by
BILL BROTHERS PUBLISHING CORPORATION

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RUBBER WORLD

JUNE, 1956

Author Addressing International Rubber Meeting

GR-S Type Synthetic Rubber—Present and Possible Future Trends[1]

By R. G. SEAMAN
Editor, RUBBER WORLD

The President's Report on rubber of April 30 emphasizes increased world dependence on synthetic rubber for the next 10 years. If enough high-yield natural rubber is planted and comes into production by the mid-1960's, natural rubber can hope to recover a part of the position it will have meanwhile lost.

The Attorney General's Report of May 1 on competition in the synthetic rubber industry indicates that a number of factors are favorable to the development and growth of competition in this industry, among which is the fact that there are 10 relatively strong SBR producers. At this juncture it would appear that no producer has achieved undue market influence.

Expansion plans of SBR producers will provide most of the presently planned additional capacity by the end of 1957. LTP-SBR use will increase at the expense of hot rubber; the use of oil-extended SBR, carbon black SBR, and oil-black SBR will increase if the quality of these masterbatches is improved.

Ample supplies of new rubber will be available during the next five years, and additional supplies of natural rubber should become available beginning in 1961. If our advancing standard of living not only in the United States, but worldwide supplies the demand for this new rubber, the producing and the consuming industries should both enjoy a decade of unusually high business activity.

THIS talk on present and future trends for GR-S type synthetc rubber, or styrene-butadiene rubber (SBR), as I prefer to call it, is based on interviews and/or correspondence with the 10 presently existing producing companies in the United States and Polymer Corp., Ltd., in Canada, and the results of a questionnaire sent to a selected list of 200 non-producer consumers in the United States. Consumers in the four major rubber companies in the United States were also queried.

I was most fortunate in that the President's Report to Congress of April 30, entitled "The Rubber Requirements and Resources of the United States," as required by the Rubber Producing Facilities Disposal Act of 1953, and the "First Report of the Attorney General on Competition in the Synthetic Rubber Industry," dated May 1, 1956, as requested by the Senate Banking & Currency Committee, were both available to me in time for this talk.

In addition, our foreign news editor, who was in Singapore and Malaya in April, reported on the natural rubber situation there as recently as May 9, and I am able to include some first-hand information from the source.

My own investigations consisted of interviews and/or correspondence with the SBR producers and also with the producers of butyl and neoprene. The questionnaire

[1] Presented before the fifteenth international meeting of the Buffalo and Ontario Rubber groups, Niagara Falls, Ont., Canada, May 11, 1956.

shown in Table 1 was finally circulated among the SBR producers in an attempt to organize this part of the investigation. Also, the questionnaire shown in Table 2 was circulated among a specially selected group of about 200 non-producer consuming companies, mostly in the small- to medium-size business category. Replies were received from more than 100 of these companies, and the results have been tabulated for each question and will be presented later, together with certain particularly pertinent comments, pro and con, for each of the questions.

TABLE 1. RUBBER WORLD GR-S RUBBER PRODUCERS QUESTIONNAIRE—MAY, 1955 TO MAY, 1956, PERIOD

1. Please list the types of GR-S type rubbers and/or latices produced under government operation during the period immediately preceding the transfer of the plant(s) to you. If some of these were X-numbers, indicate regular numbers assigned later. Check the types of grades being produced now, May, 1956.
2. Please list any new or modified types of GR-S type rubbers and/or latices you have introduced up to May, 1956. If your company is a producer-consumer, we would like to know such new and/or modified types, and, in general, how they differed from previous types, as well as those types produced primarily for sale outside your company, if possible.
3. What was the amount of GR-S type rubber and/or latices you agreed to supply small business when you purchased your plant(s) from the government? How much in % of total and tons did you actually supply to small business during the May, 1955-1956, period? We would like to know the grades involved, if possible.
4. Please indicate any trends you have observed in consumer demand with regard to hot, cold, hot black masterbatch, cold black masterbatch, cold oil-masterbatch, cold oil-black masterbatch, and hot and cold latices?
5. How much, if any, have you expanded the production capacity of your plant(s) since May, 1955? How much, if any, expansion beyond May, 1956, do you at present contemplate? Please indicate the type of rubber involved in these expansions.
6. Please indicate at what approximate price per pound for natural rubber you feel you would no longer be able to compete by lowering the price of your GR-S types?

TABLE 2. RUBBER WORLD QUESTIONNAIRE—CONSUMER REACTION—GR-S TYPE RUBBER—MAY, 1955 TO MAY, 1956

1. Do you consider the production, distribution, and service provided by private industry better than, equal to, or worse than those provided for GR-S under government control? Yes..... No..... Comments?
2. Have you been able to obtain GR-S type rubbers in the grades and amounts desired since May, 1955? Yes..... No..... Comments?
3. What grades of rubber not now available would you like to see produced? Comments?
4. Are the quality and uniformity of the rubber better than, equal to, or worse than those before May, 1955, when it was produced under government controlled operation? Comments?
5. The use of cold or LTP-type rubbers has increased steadily in the recent past. Do you consider that hot or 122° F. polymerized rubbers will eventually be completely replaced, or will there always be a demand for hot rubber? Comments?
6. Oil-extended rubber is used to the extent of about one-third of the total rubber produced, but does not seem to be in demand beyond that level at the present time. Do you expect oil-extended rubber use to increase ....., decrease ....., remain constant ....., during the next few years? Comments?
7. The use of carbon black masterbatches has ranged between 6 and 12% of the total production and is presently running at about 6%. Do you expect the use of carbon black masterbatches to increase ....., decrease ....., remain constant .....? Comments?
8. Oil-black masterbatches have been used to about only 2% of the total production. Do you expect the production of this-type masterbatch to increase ....., decrease....., remain constant ..... ? Comments?
9. Now that synthetic rubber is entirely a private industry operation, would you replace the GR-S type with natural rubber at an equal price sooner ....., or later ....., than when it was produced under government control?
10. (Optional) Company

Finally, certain of the questions on the non-producer consumers' questionnaire were circulated among the four major rubber companies, and the replies received from these consumers are included with those from the non-producer consumers, together with findings in some instances on similar questions asked by the Attorney General.

At this point, I want to express my very great appreciation to all of the people in these many companies, some of whom I know personally, but many of whom I do not, for their very great help and cooperation in answering my many questions and supplying me with important information and opinions.

What's in a Name?

First, I would like to read you an editorial I wrote for the May issue of RUBBER WORLD since it deals with a very important aspect of the future of SBR and, in fact, all synthetic rubbers. The editorial is entitled: "What's in a Name?—Depends upon When and How Used!" Table 3 is this editorial.

TABLE 3. EDITORIAL

WHAT'S IN A NAME?—DEPENDS UPON WHEN AND HOW USED!

What's in a name? In the rubber industry at the present time it depends upon when and how the name is used. *As a case in point, it is about time we stopped using the name "Government Rubber-Styrene" and the more commonly known and used abbreviation "GR-S" for general-purpose butadiene-styrene copolymers.*

This term and this abbreviation were the designations given these rubbers as produced and sold under the Government Synthetic Rubber Program from 1943 through April, 1955. The majority of the government producing plants were sold to private industry in April, 1955, and with the sale of the plant at Baytown, Tex., in July, 1955, the production of GR-S, as such, ceased.

Nevertheless the term "Government Rubber-Styrene" and, more particularly, the abbreviation "GR-S" are still being used by both the producers and consumers of this-type rubber in verbal and written communications. Getting the government out of the rubber business was a primary objective of the whole industry since at least 1950, and now private industry has been the sole source of general-purpose butadiene-styrene rubbers for about a year. This product of private industry, however, is still referred to most of the time as "GR-S."

Of course, private producers have attached their own brand names to the butadiene-styrene rubbers they make, but there are about a dozen producing companies now and an equal number of brand names for the same type of rubber. It would seem to be to the industry's best interests to decide also on a generally

acceptable generic term and abbreviation for this-type rubber as soon as possible. *Now that it is no longer "Government Rubber," let's stop calling it by that name.*

Working in the American Society for Testing Materials' Committee D-11 on Rubber, the editor of RUBBER WORLD proposed the term "styrene rubber" and the abbreviation "RS," but this abbreviation was rejected because of its similarity to the one for ribbed smoked sheets, "RSS." Two additional proposals made by others in the ASTM are now being considered. The first suggests only changing the abbreviation or coding from "RS" to "SR." The second suggests the use of the term "butadiene-styrene rubber" and the coding "SBR."

Meanwhile, since the "styrene-butadiene rubber" term and the "SBR" coding are considered to be the most descriptive and satisfactory proposals made to date, they are being adopted tentatively by RUBBER WORLD. We will be able to eliminate, therefore, the use of the awkward, cumbersome, and incorrect compromise terminology "GR-S type synthetic rubber," which has been our practice for the past several months. If a different terminology is finally found more acceptable to the industry, RUBBER WORLD will change again.

There is much more to the problem, however, than working out a generic term and coding for butadiene-styrene rubber, alone. A basic classification and coding system for other rubbers determined by chemical composition and polymer chain in the same manner as for "SBR," are being considered by ASTM, the Rubber Division of the American Chemical Society, and the Rubber Manufacturers Association. *Obviously, industry-wide standardization of terminology and coding of the basic raw materials of the industry is more important now than ever before.*

TABLE 4. WORLD RUBBER POSITION—POTENTIAL SUPPLY VS. DEMAND, 1955-1959

(Thousands of Long Tons)

	1955	1956	1957	1958	1959
DEMAND					
USA					
Natural	627	—	—	—	—
Synthetic	878	—	—	—	—
Total	1,505	1,480	1,485	1,525	1,570
Foreign					
Natural	1,241	—	—	—	—
Synthetic	155	—	—	—	—
Total	1,396	1,500	1,650	1,735	1,800
World					
Natural	1,868	—	—	—	—
Synthetic	1,033	—	—	—	—
Total	2,901	2,980	3,135	3,260	3,370
SUPPLY					
USA					
Synthetic—planned capacity	958	1,190	1,350	1,400	1,450
Foreign					
Synthetic—planned capacity	110	125	150	225	300
Natural—potential	1,850	1,875	1,900	1,925	1,950
Total	1,960	2,000	2,050	2,150	2,250
World					
Synthetic	1,068	1,315	1,500	1,625	1,750
Natural	1,850	1,875	1,900	1,925	1,950
Total—Potential	2,918	3,190	3,400	3,550	3,700
SURPLUS—POTENTIAL					
Natural and synthetic	17	210	265	290	330

The Author

R. G. Seaman, editor of RUBBER WORLD, is a graduate of Cornell University. He was employed by United States Rubber Co. for 13 years prior to joining RUBBER WORLD in 1942 as technical editor. He became editor in 1945.

As a member of the Rubber Division of the American Chemical Society, he is an active participant in the work of the education, new publications, and nomenclature committees. In the American Society for Testing Materials' Committee D-11 on Rubber he is active in the work of several subcommittees. He is the chairman of the Rubber & Plastics Division of the American Society of Mechanical Engineers for the year 1956.

I hope that you who are members of the American Society for Testing Materials Committee D-11 on Rubber, the Rubber Division of the American Chemical Society, and of the Rubber Manufacturers Association will give serious consideration to these suggestions when they or other suggestions aimed at achieving a workable classification and coding system for rubber and rubber-like materials are proposed for adoption.

World Rubber Position

In order to arrive at opinions regarding future trends with SBR, it is necessary to prepare and examine estimates of world as well as United States demand and supply for both natural and synthetic rubbers for at least the next five years. I began with the figures presented by G. O. Trenchard, of Firestone Tire & Rubber Co., at the annual meeting of the Rubber Manufacturers Association in November, 1955, and published on page 377 of the December, 1955, issue of RUBBER WORLD. (Table 4.) Unfortunately, under present-day conditions figures on world rubber position not only are controversial, but become out-of-date soon after they are made public.

Using the same form of table, therefore, I began to revise these figures from published and unpublished information obtained from various reliable sources. Finally, the figures in the President's Report to Congress of April 30, and information from industry economists have been assembled in Table 5. Natural, SBR, butyl, neoprene, and nitrile rubbers only are included in this table.

No attempt has been made to obtain figures for the many other smaller-volume specialty rubbers or for the new synthetic polyisoprenes or polyurethanes. Production and use of polyurethanes, however, were recently estimated to reach about 50,000 tons by 1960. Also I want to quote from the President's April 30 Report on the subject of synthetic polyisoprene rubber:

"This major scientific achievement in the field of rubber holds great promise for the future. In the normal course, processes will be studied in pilot plants, and

TABLE 5. WORLD RUBBER POSITION—POTENTIAL SUPPLY VS. DEMAND, 1955-1960

(Thousands of Long Tons)

	1955*	1956		1957		1958		1959		1960	
DEMAND											
USA											
Natural, 40%	635	583		604		625		646		669	
35%			510		528		547		566		586
Synthetic, 60%	895	875		905		937		970		1004	
65%			948		981		1015		1050		1087
Total	1530	1458	1458	1509	1509	1562	1562	1616	1616	1673	1673
(Based on U.S.A. NAT.)		40%	35%	40%	35%	40%	35%	40%	35%	40%	35%
Foreign											
Natural	1198	1247	1320	1236	1312	1225	1303	1214	1294	1201	1284
Synthetic	163	177	104	274	198	375	297	482	402	597	514
Total	1361	1424	1424	1510	1510	1600	1600	1696	1696	1798	1798
World											
Natural	1833	1830		1840		1850		1860		1870	
Synthetic	1058	1052		1179		1312		1452		1601	
Total	2891	2882		3019		3162		3312		3471	
SUPPLY											
USA											
Synthetic-planned capacity†	1261(*972)	1460		1718		1720		1734		(§1750)	
Foreign											
Synthetic-planned capacity‡	(*118)	125		135		200		300		350	
Natural-potential	*1833	1830		1840		1850		1860		1870	
Total	*2923	3415		3693		3770		3894		3950	
SURPLUS-POTENTIAL											
Synthetic		533		674		608		582		479	

*1955 figures actual.
†From "Rubber Requirements and Resources of the United States," Pres. Dwight D. Eisenhower's Report to Congress, April 30, 1956.
‡Estimated.
§Based on information in above-mentioned President's Report to Congress and industry sources.

NOTES: Natural rubber demand taken to equal production in all cases. Any additional natural used would have to come from stocks. Surplus or excess new rubber from 1956 on is all in form of synthetic which may be lessened in any year by greater-than-estimated demand for new rubber worldwide.

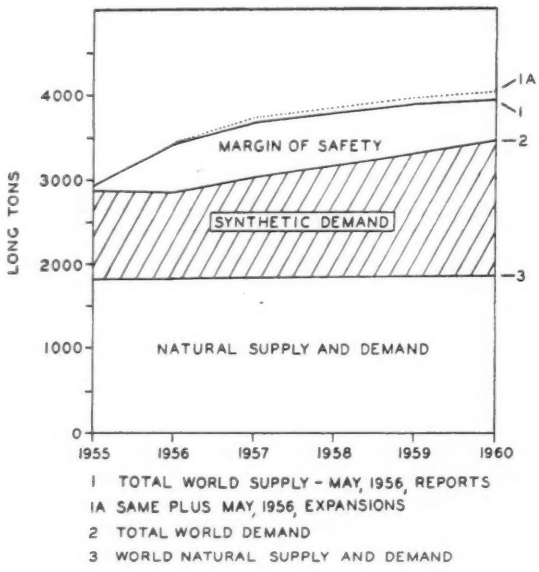


Fig. 1. Supply and demand—world total and world natural, 1955—1960

improvements in processes worked out, before any large-scale production is undertaken. It appears unlikely that large-scale commercial production will be undertaken for the next few years.

"Athough at least three companies are known to be working on polyisoprene rubber, the new synthetic offers no apparent threat to lower-priced synthetics, at least for several years . . . "

Now I will try to explain what the figures in Table 5 are supposed to show, and how they were developed with the help of Figures 1, 2, and 3. The figures under "Demand—USA" and "Demand—Foreign" are taken from the President's Report and are presented on the basis of the use of natural rubber in the USA at 40% and at 35% of total new rubber for the years 1956-1960, since only time will tell which level of use will actually occur. Also, essential to balancing of all of the figures in this table and the end-result shown at the bottom as "Surplus—Potential" are certain conclusions on natural rubber production and availability in this Report, which states:

"During the next five years, the production could range from below 1,800,000 to above 1,900,000 long tons, with annual fluctuations depending on price.

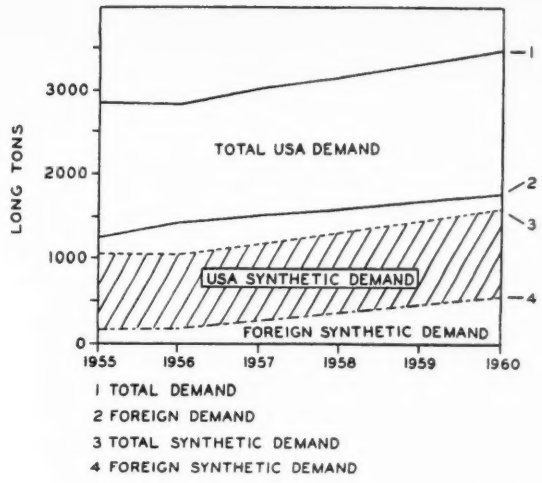


Fig. 2. Total world demand and foreign vs. USA demand. Foreign and total synthetic demand also shown

"In this tabulation world annual production of natural rubber is stated in a range around 1,850,000 long tons, which is a much narrower range than is likely to be obtained; and after a decline in 1956 is shown as steadily rising, although there may in fact be no increase if much of the rubber acreage now producing is destroyed and replanted."

In addition, important to the understanding of the figures in Table 5 is the fact taken from the President's Report that "the approximate quantity of synthetic rubber that would need to be used in foreign countries to permit imports of natural rubber into the United States sufficient to satisfy 40% of our projected new rubber requirements" has been estimated and is shown in the line "Demand—Foreign Synthetic." I have presented figures based on both 40 and 35% use of natural rubber in the USA since there are many in the industry in this country who feel that the 35% figure will be actually the more correct one.

Under "Supply—USA Synthetic—Planned Capacity" the figures given are taken from the President's Report.

The figures for "Foreign Synthetic—Planned Capacity" are based on information in the President's Report and from my own industry sources.

"Natural Potential" are the figures from the President's Report referred to above, which vary in a narrow range about 1,850,000 long tons per year.

Finally, we have the "Surplus Potential" beginning with the year 1956 and ranging from 533,000 long tons in 1956 to 479,000 long tons in 1960.

In Figure 1, I have drawn in curve 1 and 1A the total world supply of both natural and synthetic rubbers. Curve 1 is based on figures from the President's Report, and curve 1A adds certain additional capacity figures estimated by the producers of SBR, butyl, and neoprene rubbers, on May 1, 1956, that are somewhat higher than the figures in the government reports. Curve 2 is the total world demand and curve 3 is the natural supply and demand which are expected to be in balance during the period covered and therefore will not permit any expansion in demand unless it is taken care of by withdrawal from stocks. The cross-hatched area marked "synthetic demand" shows that the rising trend of total demand will have to come from expanding synthetic production. The area marked "margin of safety" is the "surplus potential," all in synthetic rubber.

Figure 2 shows total world demand for both natural and synthetic rubbers in curve 1 and total foreign demand in curve 2. The difference between these two curves is the area marked "total USA demand." Figure 2 may be a little confusing because I have also included on it in curve 3, total synthetic demand under curve 2 for total foreign demand, with which curve 3 has no direct relation. Curve 4 for foreign synthetic demand, however, permits me on this same curve to show the relation among total synthetic demand, USA synthetic demand, and foreign synthetic demand, the area at the very bottom of the graph. Synthetic demand for USA in Figure 2 was based on the use of 40% natural rubber in the USA.

Figure 3 again shows in curve 1 the total world natural and synthetic rubber demand, and curves 2 and 2A are world total synthetic demand plus foreign natural demand; curve 2 is for natural consumption in the USA at 40% of total, and curve 2A, for USA consumption at 35% of total. The area between curves 1 and 2A, and between 1 and 2 is, therefore, the amount of natural to be consumed in the USA according to the two different ratios of natural to synthetic consumption.

In Figure 3 curve 3 is total world synthetic demand so that the areas between 2A and 3, and between 2 and 3, represent the foreign natural demand, depending upon whether the USA is able to use 40% natural or 35% natural. Curves 4 and 4A are foreign synthetic demand, again based on 40 or 35% use of natural in the USA. Curve 4 is the amount of synthetic used abroad if USA uses 40% natural, and curve 4A is the foreign synthetic use if USA uses 35% natural. The areas between curves 3 and 4 and 4A are again, therefore, USA synthetic use, and the area at the extreme bottom of the figure is for-

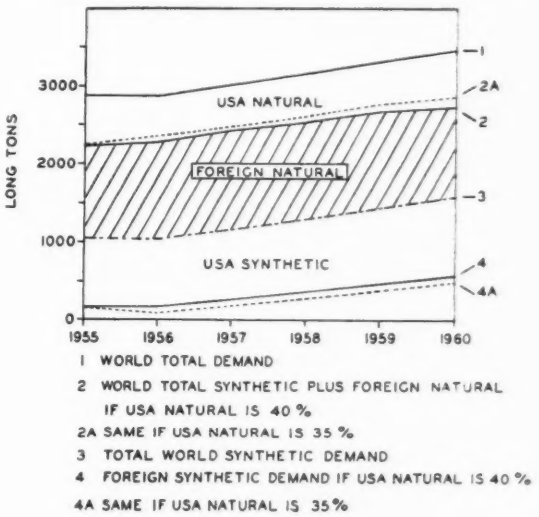


Fig. 3. World, USA, and foreign demand—total natural and synthetic

eign synthetic use. The relation of total demand, USA demand, and foreign demand for both natural and synthetic rubbers is illustrated, therefore, in Figure 3.

Before we consider the possible implications of a potential surplus of synthetic rubber beginning with 1956, the percentage of the total of all synthetic rubber figures that is of the SBR type should be indicated. In 1955 "net" polymer SBR divided by total "net plus oil" accounted for 80% of the total available capacity in the USA; while "net plus oil" SBR divided by total "net plus oil" accounted for 73%. In 1960 on a "net" polymer basis SBR will account for 82% of the total capacity, and for 74% on a "net plus oil" basis. I like to think in terms of "net" polymer so that I will use the 80% figure. Therefore the "Surplus Potential" in synthetic rubber for the years 1956 through 1960 will be approximately four-fifths of that given in Table 5.

Returning to the matter of the potential surplus of synthetic rubber for the years 1956-1960, the total new rubber consumption figures for the USA used in Table 5 and Figures 1, 2, and 3 were based on a conservative 3.5% increase per year and for total new rubber consumption per year, and foreign consumption on a similarly conservative 6% per year increase. There are many reasons to believe that these percentage increases per year will be exceeded, particularly outside the USA. Furthermore, I would like to quote Howard H. Heilman, who in the Lockwood-Heilman Report for January, 1956, said in part, in discussing "Growth — Not Surplus":

"Let us refer for the moment to projections for 1960 of 1.9 million tons of natural rubber production and approximately 1.9 million tons of total synthetic capacity. With an availability, therefore, of 3.8 million tons, some statements of 1960 surpluses are before us — with the indicated potential of 200,000 to 300,000 tons described as surplus. First of all, in choosing the 300,000 tons it is evident that this volume represents only 8 % in excess for the total of 3.8 million tons. Since in the instance of synthetic we must have flexible capacity to produce it, then it appears that the 8%, or even 16%, is hardly a surplus at all unless we conclude that no further expansion is then ahead for the rubber industry. In the period from four to eight years from now it seems reasonable to expect that synthetic capacity should have some 10 to 20% excess capacity against a given year's average rate of consumption. This seems a requirement if the synthetic industry is to meet the seasonal peaks of demand, and more important is to grow and meet the expansion in the years following. A calculation of 300,000 tons differential seems more properly described as indicating the normal situation under competition of capacity *vs.* demand, and it would be a real barometer of growth and active competition as opposed to surplus for either synthetic rubber or natural rubber." [This reasoning seems equally applicable to 500,000 tons. — RGS.]

I have presented in Table 6 which was taken directly from the President's Report, expansion plans for facilities to produce not only SBR, but butyl, neoprene, and nitrile rubbers, with the total indicated on both "net" and "net plus oil" basis.

Included are the capacities of the Institute plant and the new plant to be constructed by General Tire for SBR. In this Report it is stated in this connection that:

"Producers of neoprene and N-Type rubber state that they will provide capacity sufficient to take care of the full demand for these types of rubber."

This same statement may now be applied to the producers of butyl rubber, as will be shown later.

The column on the extreme right of Table 6 contains the figures for % SBR of total planned capacity calculated on a "net" and "net plus oil" basis for the years 1955 and 1960, as mentioned in discussing "Surplus Potential" in Table 5.

SBR capacity is scheduled to increase from 915,000 long tons at the end of 1955 to 1,290,000 long tons at the end of 1960 on a "net" basis, and from 1,029,900 long tons to 1,460,000 long tons on a "net plus oil basis" by the end of 1960. Also, on a "net plus oil" basis, capacity for the production of the all synthetic rubber listed is scheduled to reach 1,745,600 long tons. I will quote from the President's Report again in connection with these expansion plans:

"Plans are dependent on the growth of demand in this country and overseas. These plans include commitments already reduced to contracts, and also less definite expectations, some of which may not come to fruition. In a broad sense, they reflect the firm intention of industry to meet all future demands for synthetic rubber. Some excess capacity is necessary to meet peak demands, both cyclical and seasonal. Domestic consumers of rubber appear to have ample assurance that their future needs for synthetic rubber will be fully supplied by competitive private producers. Competitive processes can also be depended on to provide sub-types of S-Type and other synthetic rubbers in accordance with demand, judging from industry practice in 1955."

SBR—May, 1955 to May, 1956

We have spent quite a little time peering into the future. Now let's take a look at the past, the recent past, May, 1955, to May, 1956, and with special reference to SBR.

My approach to determining how producers and consumers of SBR fared during the first 12 months of operation as a private industry operation was a simple one. I asked them. Meanwhile, the Attorney General was using the facilities of the Federal Bureau of Investigation to do the same thing. My information is not so extensive or so detailed as that collected by the FBI, but, since I made my inquiries a few months after the FBI, some additional new information became available.

SBR Grades, May, 1955, *vs.* May, 1956

After preliminary interviews and correspondence with the SBR producers the questionnaire shown previously, Table 1, was circulated. From the answers to the first two questions and other sources Table 7 was prepared. Table 7 is intended to show:

(1) Grades produced when the plants were transferred to the various producers. (2) Grades discon-

TABLE 6. REPORTED PLANS FOR EXPANSION OF FACILITIES FOR PRODUCING SYNTHETIC RUBBER, 1955-1960, COMPARED WITH ACTUAL 1955 CAPACITY*

(Thousands of Long Tons)

	SBR Type					Total		
End of	"Net"	"Net Plus Oil"	Butyl	Neoprene	N-Type	"Net"	"Net Plus Oil"	% SBR† of Total
1955	915.0	1029.9	90.0	100.0	40.8	1145.8	1260.7	80-73
1956	1031.9	1181.0	90.0	125.0	63.9	1310.8	1459.9	
1957	1272.1	1435.8	90.0	125.0	67.4	1554.5	1718.2	
1958	1273.1	1436.8	90.0	125.0	68.1	1556.2	1719.9	
1959	1285.1	1448.8	90.0	125.0	70.6	1570.7	1734.4	
1960‡	1290.0	1460.0	90.0	125.0	70.6	1575.6	1745.6	82-74

*From President's Report to Congress of April 30, 1956.
†"Net" polymer SBR on total "net" polymer and total "net plus oil."
‡Own estimates for 1960.

tinued by the various producers since May, 1955. (3) Grades added by the various producers as previously existing grades, but not produced under government operation at a given plant, and (4) new or modified grades.

In Table 7 pre-May, 1955, government grades still being produced are identified by X; pre-May, 1955, grades added to the lines of various producers, by A; and pre-May, 1955, grades removed from the lines of certain producers, by O. X in parentheses means a new grade.

It appears from this compilation that 15 grades have been discontinued, and 22 grades have been added to the lines of all producers for a net gain of 7, if only the regular existing grades are considered. An additional five new grades have been added, for an overall total of 12 new grades. The grades produced by Polymer Corp., Ltd., in Canada have been included in this table.

An analysis of these changes shows that 10 grades were added and six discontinued among the hot unpigmented rubbers for a net gain of four. Two hot-black grades were discontinued. Two regular grades and three new grades were added to the cold unpigmented rubber, while two grades were discontinued for a net gain of three. One cold-black grade was discontinued, and one was added. Eight regular cold oil-extended grades were added; three were discontinued, and two new grades were added for a net gain of seven in this category. One regular grade of hot latex was added to the list, and one discontinued.

The changes by types were 12 added for the hot and cold unpigmented rubbers, and the greatest increase in grades added to the line was for the cold oil-extended rubber with 10 added. All new grades not previously made under government operation were of the non-staining variety.

SBR to Small Business

One of the questions on the producers' questionnaire inquired as to the amount of rubber each producer had agreed to supply small business when he purchased the government SBR plant or plants, and how much had actually been supplied during the period May, 1955, to May, 1956.

The Attorney General's Report provides considerable information on the amount of rubber supplied small business for the period May through December, 1955. This Report states, in part, in this connection:

"Of the 500,150 long tons of GR-S rubber produced ownership, the producers reported that 143,902 long tons, or almost 29%, were sold to small business enterprises as defined in section 21 (h) of the Disposal Act. From Table 8 it will be noted that the producers' contract commitments, when measured against production in the survey period, required 22.7% of total output in the survey period be made available to small business enterprises. This commitment appears to have been exceeded by each producer and by the industry as a whole when sales to small business are measured against either production or sales."

Table 8 is taken directly from the Attorney General's Report. An additional column on the extreme right includes information obtained by RUBBER WORLD for the period May, 1955, to May, 1956. There is substantial agreement that the producers are making the contracted amounts and somewhat more available to small business.

Apparently there is some difficulty with the exact definition of a small business, but the Attorney General seems to be satisfied when he says:

"While considerable controversy centered about the enforcement of the small business provisions of the copolymer plant purchase contracts throughout the course of Congressional consideration of disposal legislation, the first eight months of private ownership failed to provide an opportunity for a legal test of these provisions. Although there was a sellers' market in GR-S throughout the period and a general shortage of supply particularly in the latter months of 1955, no evidence was uncovered by this survey to indicate the need for recourse to the courts for enforcement of the small business provisions of the sales contracts."

Trends in Demand for SBR Grades

Trends in demand for SBR grade use were estimated from the producers' questionnaire, the Attorney General's Report, and a comparsion prepared from Department of Commerce figures for the months March, 1955, and March, 1956. Table 9 includes, on the left, figures from the Attorney General's Report for the eight-month period May-December, 1955, and shows the percentages of hot, cold masterbatched and not masterbatched polymers, all on a "net" polymer basis. On the right a comparison between production on a similar basis for March 1955, against March, 1956, is shown.

It will be noted that although the trend is not too pronounced, the production of cold rubber is increasing at the expense of the hot. With regard to the various masterbatches, on a percentage basis the total

TABLE 7. SBR GRADES PRIVATELY PRODUCED—MAY, 1956

Grade No.	ARSC	Copo	Firestone	G-G	Goodyear	Phillips	Shell	Texas-U. S	U.S. Rubber	United R. & Chem.	Polymer
Hot SBR											
1000			X	A	O	X	X	X			
1001				A		X	X	X			
1002			O	A			A	X			
1003								O			
1004			X								
1005			O								
1006			X	A	X	X	X	A			
1007								X			
1009			X			X		X			
1010			X			O					
1014							X				
1012			X					A			
1013			X				A	A			
1014			O								
1015			X								
1016									X		
1018						X			X		
1019						X			X		
1021									X		
1022									X		
1023									X		
1061								(X)			
X-274								X			
S											X
S-50											X
S-65											X
S-X-371											X
Hot Black SBR											
1100						O	X				
1104						O					
Cold SBR											
1500	X	X	X			X	X	X			
1501			O				X	O			
1502	X	A	X	A	X	X	X				
1503						X			X		
1504									X		
1551		X						(X)			
SS-250											A
Krylene											(X)
Krylene NS											X

NOTES: A—Regular government grade since added to line of plant. O—Regular government grade discontinued from line of plant. (X)—New grade not government produced—added to line.

TABLE 8. GR-S SALES AND COMMITMENTS TO SMALL BUSINESS ENTERPRISES, MAY-DECEMBER, 1955

Company	% of Small Business Sales to*		% of Production Committed by Contract	% to Small Business—RW Questionnaire
	Production	Total Sales		
American Synthetic Rubber Corp.	13.8	15.4	+10.0	10-15
Copolymer Rubber & Chemical Corp.	11.4	11.8	10.0	n.a.
The Firestone Tire & Rubber Co.	30.9	‡26.7	20.0	20.0
Goodrich-Gulf Chemicals, Inc.	19.8	21.8	16.7	17
Goodyear Synthetic Rubber Corp.	21.8	‡15.0	10.0	15
Phillips Chemical Co.	68.3	54.4	50.0	+50
Shell Chemical Corp.	32.1	27.7	22.5	23
Texas-U. S. Chemical Co.	21.4	22.2	20.0	20+
United States Rubber Co.	58.6	‡69.8	†60.0	60+
United Rubber & Chemical Co.	57.0	37.9	§40.0	n.a.
Industry average	28.8	25.3	22.7	

*Information furnished to the Department by the producers.
†Based on commitments made in testimony before House Armed Services Committee: hearings on H. R. 2882, H. Res. 170, and H Res. 171, 84th Cong. 1st sess., pp. 1172, 1173, 1174.
‡Total sales include intracompany transfers.
§Report to Congress, June 10, 1955, p. 50A.
n.a.—not available.

TABLE 7 (*Continued*)

Grade No.	ARSC	Copo	Firestone	G-G	Goodyear	Phillips	Shell	Texas-U.S.	U.S. Rubber	United R & Chem.	Polymer
Cold Black SBR											
1600						O	X			X	
1601						X	A			X	
1602						X	X			X	
1605						X					
Cold-Oil SBR											
1703			X	A	X	X	X	A			
1705			X	A							
1706						X	X				
1707				A			X	A			
1708						X		A			
1709							X				
1710			X	X	X						
1711				O		O		A			
1712		A	O	X		X	X				
1773					(X)						
1778					(X)						
Krynol 651											X
Krynol 652											X
Cold Oil-Black SBR											
1801							X			X	
1803						X					
Hot SBR Latices											
2000			X				X		X		
2001			X						X		
2002			X						X		
2003			X								
2004			X				O				
2005									X		
2006			X				A		X		
Cold SBR Latices											
2101		X			X		X		X		
2102		X									
2104					X						
2105		X	X		X				X		
X-767		X							X		
Polysar Type 2											X
Polysar Type 4											X

polymer masterbatched in March, 1956, is actually somewhat less than in March, 1955. Oil-extended rubber amounts to about 25% of the total; carbon black masterbatch has increased slightly, and oil-black masterbatch has decreased, although the low figure for March, 1956, is unusual and should not be considered as real evidence of such a marked trend. Also, since little masterbatched rubber is exported, domestic consumption of masterbatched rubber may actually be higher than these figures indicate.

Table 10 shows the various types of SBR made by the various producers and the percentage of total for each type. This information is from the Attorney General's Report. Similarly, Table II, shows the producers of latex and the percentage produced by each.

Producer comments based on their interpretation of consumer demand predict a continued increase in the use of cold over hot rubber and particularly cold rubber latices. It is felt that the demand for oil-extended rubber has slowed somewhat and will require further education of consumers for both the cold oil-extended and the cold oil-black masterbatches. Although the demand for carbon black masterbatches has not varied greatly, some customers are looking for a wider variety of carbon black masterbatches and improved quality, with special reference to dispersion, in these masterbatches. In Canada I am told that the consumption of cold oil-extended rubber is increasing at the present time.

Comments from non-producer consumers and producer-consumers will be covered in the report of the answers to these separate questionnaires.

Expansion Plans—SBR Producers

In our questionnaire to the SBR producers we asked how much they had expanded production since May, 1955, and how much additional expansion, if any, they contemplated beyond May, 1956. The May 1 Report of the Attorney General included a table which provided answers to the same question and I have included that table as the major part of Table 12. Such additional information as I was able to obtain independently is added in the column on the extreme right.

Note first that capacity increased from 733,600 long tons in May, 1955, to 813,000 tons at the end of 1955 and is expected to increase to 1,010,200 tons at the end of 1957, according to the Attorney General's Report. These figures are on a "net" polymer basis. Our own information obtained a few months after

TABLE 9. TREND IN CONSUMER DEMAND FROM SBR PRODUCTION FIGURES

(Most Figures Net SBR)

	Atty. Gen. Report May-Dec. 1955		RUBBER WORLD Estimate*			
	Production (Long Tons)	% Total Prod.	Prod. Mar. '55 (Long Tons)	% Total Prod.	Prod. Mar. '56 (Long Tons)	% Total Prod.
Regular	139,735	27.4	18,003	31.0	18,196	25.0
Cold SBR	370,135	72.6	40,280	69.0	53,304	75.0
Total	509,870	100.0	58,283	100.0	71,500	100.0
Masterbatched						
Oil masterbatch	115,172	22.6	14,995	25.5	16,907	23.6
Carbon black mb.	27,670	5.5	2,816	4.9	4,474	6.3
Oil-black mb.	16,201	3.3	1,837	3.1	614	0.9
Total mb.	159,043	31.4	19,648	33.5	21,995	30.8
Not Masterbatched	350,827	68.6	38,635	66.5	49,505	69.2
Total	509,870	100.0	58,283	100.0	71,500	100.0
Total SBR plus Oil	575,903		64,030		77,298	
Latex Included above						
Hot	—		4,202		2,521	
Cold	—		2,789		3,348	
Total	44,384		6,991		5,869	

*Calculated from Department of Commerce, BDSA, Chemical & Rubber Bureau figures.

TABLE 10. PERCENTAGE DISTRIBUTION OF PRODUCTION BY COMPANY BY TYPES OF GR-S, MAY-DECEMBER, 1955*

Company	Carbon Black Masterbatch, Cold and Regular	Oil Black Masterbatch, Cold	Oil Masterbatch, Cold	Not Masterbatched†	
				Cold	Regular
American Synthetic Rubber Corp.				15.9	
Copolymer Rubber & Chemical Corp.			2.7	14.0	
The Firestone Tire & Rubber Co.			19.7	16.4	28.7
Goodrich-Gulf Chemicals, Inc.			9.1	18.5	10.6
Goodyear Synthetic Rubber Corp.			29.3	10.8	24.3
Phillips Chemical Co.	39.0	13.6	7.4	4.4	3.4
Shell Chemical Corp.	9.9	9.1	14.2	8.0	10.5
Texas-U. S. Chemical Co.			17.6	9.3	15.4
United States Rubber Co.				2.7	5.3
United Rubber & Chemical Co.	34.3	61.4			
All other†	16.8	15.9			1.8
Total	100.0	100.0	100.0	100.0	100.0

* Taken from "First Report of the Attorney General on Competition in the Synthetic Rubber Industry," May 1, 1956.
† Production at Baytown, Tex., prior to transfer to United Rubber & Chemical Co.
‡ Includes latex.

TABLE 11. DISTRIBUTION OF GR-S LATEX PRODUCTION BY COMPANY, MAY-DECEMBER, 1955*

Company	% Total Production
American Synthetic Rubber Corp.	—
Copolymer Chemical & Rubber Corp	10.0
The Firestone Tire & Rubber Co.	34.1
Goodrich-Gulf Chemicals, Inc.	2.4
Goodyear Synthetic Rubber Corp.	26.3
Phillips Chemical Co.	—
Shell Chemical Co.	3.8
Texas-U. S. Chemical Co.	—
United States Rubber Co.	23.4
United Rubber & Chemical Co.	—
Total	100.00

*Taken from "First Report of the Attorney General on Competition in the Synthetic Rubber Industry," May 1, 1956. Information furnished to the Department of Justice by the producers.

the material for the Attorney General's Report was collected raises the capacity at the end of 1957 to 1,055,200 tons, without including the capacity of the Institute plant purchased recently by Goodrich-Gulf, and the new 40,000-ton plant to be constructed by General Tire. If these two additional plant capacities are added to our total, it becomes 1,217,200 tons, which is in reasonable agreement for discussion purposes with the 1,272,100 tons estimated in the other report, that of the President to Congress and shown previously in our Table 6. Converted to "net polymer plus oil," this figure amounts to 1,460,000 tons.

It should also be mentioned that Polymer Corp., Ltd., expects to attain a capacity of 110,000 long tons by the end of 1956 for all synthetic rubbers produced in Canada.

TABLE 12. SBR PLANT EXPANSIONS

	Attorney General's Report Table—Capacity						RUBBER WORLD* Estimates May, 1956	
	May 1, 1955		Dec. 31, 1955		End, 1957		Capacity End, 1957	
	Long Tons	% of Total	Long Tons	% of Total	Long Tons	% of Total	Long Tons	% of Total
American Synthetic Rubber Corp.	44,000	6.0	50,000	6.2	50,000	5.0	70,000	5.8
Copolymer Rubber & Chemical Corp.	49,000	6.7	56,300	6.9	67,600	6.7	67,600	5.6
The Firestone Tire & Rubber Co.	129,600	17.7	167,000	20.5	190,000	18.8	205,000	16.8
Goodrich-Gulf Chemicals, Inc.	90,000	12.3	112,500	13.8	123,000	12.2	123,000	10.1
Goodyear Synthetic Rubber Corp.	114,800	15.6	127,000	15.6	186,000	18.4	186,000	15.3
Phillips Chemical Co.	63,000	8.6	54,100	6.7	108,000	10.7	108,000	8.9
Shell Chemical Co.	89,000	12.1	89,000	11.0	100,000	9.9	110,000	9.0
Texas-U. S. Chemical Co.	88,000	12.0	91,000	11.2	111,600	11.0	111,600	9.2
U. S. Rubber Co.	22,200	3.0	22,200	2.7	30,000	3.0	30,000	2.4
United Rubber & Chemical Co.	44,000	6.0	44,000	5.4	44,000	4.3	44,000	3.6
Total	733,600	100.00	813,000	100.00	1,010,200	100.0	1,055,200	
Goodrich-Gulf Chemicals, Inc. (Institute Plant)							122,000	10.0
General Tire & Rubber Co. (New Plant)							40,000	3.3
Final Total							1,217,200	100.0

*RUBBER WORLD estimates are based on information which became available after the Attorney General's Report was completed. As far as it has been able to determine, these figures are "net polymer." The total figure agrees reasonably well with that in Table 6 where 1,272,100 was given for the end of 1957.

Polymer Corp., Ltd., in Canada will have a total additional capacity by the end of 1956 of 110,000 long tons (includes butyl, nitrile).

I have underlined the capacity figures on the extreme left to show the maximum range on expansion for the majority of the producers who have supplied information on their plans. Goodrich-Gulf will have available about 20% of the total capacity; Firestone, about 17%; and Goodyear, 15%, according to these latest figures.

Expansion Plans—Butyl and Neoprene Producers

The producer of butyl rubber in the United States is the Standard Oil Co. of New Jersey, which markets this rubber through Enjay Co., Inc., and in Canada is Polymer Corp., Ltd. Although the large-scale use of the tubeless tire, which began in 1954, has considerably reduced the demand for butyl rubber, Enjay expects to increase the use of butyl rubber in non-transportation items so that the demand in 1960 will be 60% more than the estimated demand of 70,000 long tons in 1956 and will amount to as much as 115,000 long tons. Table 13 estimates demand for certain years between 1956 and 1960, and actual consumption for 1953, 1954, and 1955, broken down to show consumption in transportation and non-transportation products. Note that Enjay expects a reversal of usage in the transportation and non-transportation categories between 1956 and 1960.

These consumption estimates for butyl rubber will be the basis for production expansion plans which in turn are based on the policy of providing whatever capacity is necessary to satisfy the demand either as

TABLE 13. ACTUAL AND ESTIMATED FUTURE DEMAND FOR BUTYL RUBBER

(Long Tons)

	Total Demand				
Year	Transportation Prod.		Non-Transportation Prod.		Total
1953	74,100	95%	3,900	5%	78,000
1954	58,425	95%	3,075	5%	61,500
1955	43,200	80%	10,800	20%	54,000
1956	52,500	75%	17,500	25%	70,000
1958	55,000	50%	55,000	50%	110,000
1960	35,000	30%	80,000	70%	115,000

production by Esso and affiliated companies or by licensees. Enjay visualizes a growing export demand.

Enjay considers butyl rubber in competition first with natural rubber and then with other synthetics. Present development work aimed at the use of butyl rubber in tires has been done with passenger-car tires because such development can be done more rapidly with this type of tire. With the emphasis on butyl rubber as a replacement for natural rubber, the aim is actually directed toward future use of butyl in truck tires.

Neoprene is third ranking elastomer in the United States. Early in 1957 when a new plant in Michigan is completed, production capacity will equal 129,000 long tons a year.

It is expected that the market for neoprene will expand at the expense of natural rubber and SBR

through its use in blends to upgrade quality. Neoprene in tires, white sidewall compounds, and as a lining for tubeless tires are examples of its use as replacement for natural rubber. At present, neoprene's largest markets are in mechanical goods and in wire and cable, but many other nontransportation uses are visualized.

Du Pont's chlorosulfonated polyethylene, or "Hypalon," is also expected to be used with neoprene and natural rubber where improved resistance to severe service conditions is desired. A new plant for the production of 6,800 long tons a year of "Hypalon" will be in operation in 1957.

Urethane rubbers and foams are also expected to compete with both natural and SBR to the extent of as much as 50,000 long tons a year by 1960.

Plans of Natural Producers

I mentioned at the beginning of this talk that RUBBER WORLD's foreign news editor was in Malaya in April, and a report received as recently as May 9 contained some interesting information on what the producers of natural rubber in Malaya and Singapore think about the production of natural rubber during the next five years.

I will quote directly from this report:

"On the whole opinion seems to be that production of natural rubber is not likely to increase; there may even be a shortage until 1959-60 as the Malayan replanting scheme for estates gets under way, and large areas are thereby made unproductive. Furthermore, reduced output is foreseen for Indo-China and Indonesia. In the case of the latter, more and more rubber is becoming obsolete, and little or no replanting has been done since the end of the war; besides, a considerable amount of rubber has been ruined by illegal tapping. This evil continues in spite of government efforts to check it.

"Practically all the people I spoke to shared these opinions except the head of one of the large estate producing companies, who viewed the matter from a different angle. He took the position that all estimates of rubber production made up to June 1, 1955, are likely to be low, and went on to develop his reason for his belief that there might be an increase in production instead of a decrease. He explained the facts of replanting—the factors governing its progress or delay and the ultimate effect of either on production within the next five years.

"Replanting can be delayed—as it is at present—by high prices, since many estates as well as smallholders will be reluctant to cut down their trees and thus forego the immediate profits to be made. It may be delayed if there is a considerable increase in the cost of labor.

"It was emphasized that if wages went up even by about 30% many owners would not be able to afford the cost of replanting since the wages of estate laborers account for about 65% of the total cost of producing rubber. At present, the government offers estates a grant of $400 per acre replanted, a sum which in most cases covers half the total cost of replanting at existing wage rates. If this grant remains at $400, while higher wages raise the part of the replanting costs for which the owner himself is responsible substantially above $400 per acre, many marginal estates might find it too expensive to replant. Production levels would thus be maintained for a time, but naturally long-term production would suffer because obsolete areas would not have been replanted with high-yielding material.

"When replanting does progress, there is still the likelihood that outputs will be maintained and even increased. Estate planting may be spread over a period of seven years; areas intended to be replanted first undergo a period of slaughter tapping to get the greatest amount of rubber out of them before they are cut out; crops from these areas consequently are considerably above normal for a time and are said to be spectacular when yield stimulant is used—a practice that seems to be gaining on some estates."

Finally, our foreign news editor said:

"All these facts point to an increase rather than a decrease in production in the next five years. However, when I asked whether the majority of natural rubber producers could sell to the United States at a price to meet 25¢ a pound for SBR in the United States and still make an adequate profit, I was told:

"At any given price for natural rubber which approaches 25¢ a pound for SBR, increases in wages in producing centers will tend to drive marginal estates out."

Grades of natural rubber other than the standard RMA grades being worked on in Malaya were reported as Technically Classified Rubber, Superior Processing Rubber, and a rubber-lignin masterbatch. It was stated that production of TC Rubber was practically static because of lack of additional demand. Production of Superior Processing Rubber has amounted to only 50 tons in the last few months. The amount of production of the lignin masterbatch was not indicated.

In connection with latex, present research is being directed toward the production of bacteria-free latex. It is hoped that studies on latex produced under the most sterile conditions might enable the determination of the harmful or beneficial effects of different bacteria and thus obtain data on the cause of variability, which in turn might lead to methods of maintaining and improving quality.

Consumer Comments

As mentioned previously, a questionnaire was circulated to about 200 non-producer consumers to get their reactions to operation of the SBR plants during the last 12 months by private industry, as compared to operation under government sponsorship. About 110 replies were received although not all respondents replied to all of the questions asked.

In addition, similar questions were asked of the consumers of SBR in the four major rubber companies, all of whom are also producers of SBR.

The answers to these questions are shown on the following tables and also include comments in the Attorney General's Report where answers to similar questions were asked a few months previously.

Table 14 shows that 88 companies consider the production, distribution, and service provided by private

industry to be equal to or better than those provided while the SBR plants were operated by the government; 15 companies feel that they were worse. Certain selected comments *pro* and *con* are included on the slide. Note also that comments in the Attorney General's Report concur in general with RUBBER WORLD findings, except that the percentage expressing dissatisfaction was somewhat higher for the RUBBER WORLD answers. The number of companies interviewed by the Justice Department was 55.

TABLE 14. RUBBER WORLD QUESTIONNAIRE—CONSUMER REACTION—SBR RUBBER

1. Do you consider the production, distribution and service provided by private industry better than, equal to, or worse than those provided for GR-S under government control?

Equal or Better	88
Worse	15

Comments—Consumers

Favorable: Better; do not believe same interest in production and service was obtained under government operation.

The service and cooperation of private industry have been better than while under government control.

Private industry seems to be more anxious to serve and to make allowances in getting material to plants in times of emergency.

Unfavorable: We feel it to be no better and perhaps worse than under government control, especially prior to February, 1956.

Worse. Private industry has, we believe, complicated the procurement problem.

Comments—Attorney General's Report

"Less than 10% of the companies interviewed expressed dissatisfaction with the industry's performance under private ownership or foresaw problems which might arise in the future. . . . On the other hand there were a significant number of small companies that found private enterprise superior to government operation. The advantages listed by these companies may be classified under two major headings: (a) improved relationships between buyer and seller; and (b) superior technical liaison and assistance."

Table 15 reports that 77 companies have been able to obtain the SBR grades and amounts of rubber they desired since May, 1955, but that 26 companies could not. Note, however, that the latter companies seem to have been able to obtain the necessary rubber since early 1956. Comments from the Attorney General's Report on this matter are included.

TABLE 15. RUBBER WORLD QUESTIONNAIRE—CONSUMER REACTION—SBR RUBBER

2. Have you been able to obtain GR-S type rubbers in the grades and amounts desired since May, 1955?

Yes	77
No	26

Comments—Consumers

Favorable: Shipments have been made as requested.

Supply sufficient. Certain cross-linked types occasionally in short supply.

Yes, provided our orders are placed in sufficient time to comply with delivery schedules.

Unfavorable: Since late February we have been able to obtain grades and amounts required. Prior to that we could not.

We were not able to obtain enough to meet our requirements until January, 1956.

Comments—Attorney General's Report

"This survey established that, despite the shortage of GR-S in the last few months of 1955, practically all small rubber fabricators interviewed, had, in their opinion, received a fair share of synthetic rubber at fair prices. Slightly more than half the companies comprising the sample reported that they had obtained adequate GR-S supplies while the remainder indicated they had experienced some degree of difficulty in obtaining GR-S due, in large measure, to the general stringency of supply. . ."

Table 16 presents comments from consumers on new grades of rubber they would like to see produced. Note that there are five requests for synthetic polyisoprene. Interest seems to be in a greater number of non-staining grades, better and more numerous carbon black masterbatches, and better aging polymers.

TABLE 16. RUBBER WORLD QUESTIONNAIRE—CONSUMER REACTION—SBR RUBBER

3. What grades of rubber not now available would you like to see produced? Comments?

Comments—Consumers

Better non-staining grades. Grades with higher tensile strength and better building tack.

1502 without rosin acid. A latex which could be used as a substitute for natural to better advantage in foam and dipped goods.

Carbon black masterbatch with ISAF black.

A non-discoloring grade of the high styrene type such as 1014.

Better SBR types for chemically blown sponge. Less expensive ozone and sunlight resistant rubber.

A black masterbatch properly dispersed for the calendering of thin films.

LTP grade similar to 1012—high Mooney viscosity.

Grades with low styrene contents and serviceable at low temperatures.

Less discoloring and better aging polymers. Also, improved quality polymer for original and aged properties in light-colored compounds.

Oil-black masterbatch with MT carbon black.

1503 type at 1502 price. Use of oils in oil masterbatches that are less discoloring.

Five requests for synthetic polyisoprene.

Table 17 shows that 95 companies feel that the quality and uniformity of SBR as made by private industry are better than when it was made under government control. Five companies feel that they are worse. It would appear from these results that the producers have done a good job on quality under difficult circumstances.

TABLE 17. RUBBER WORLD QUESTIONNAIRE—CONSUMER REACTION—SBR RUBBER

4. Are the quality and uniformity of the rubber better than, equal to, or worse than before May, 1955, when it was produced under government controlled operation? Comments?

Equal or Better	95
Worse	5

Comments—Consumers

Favorable: Quality and uniformity appear to be much better.

We no longer encounter improperly dried rubber as in the past.

We consider quality better and improving. We expect considerable advancement under private ownership.

Equal. Have had some difficulty where manufacturer

changed manufacturing process without notifying customer. Changes appear to be minor, but caused buyer processing troubles.

Unfavorable: We have noticed more variation since the change. Mostly variation between sources.

No improvement. Still erratic.

Table 18 records the opinion by 28 companies that hot rubber will be completely replaced by cold; while 56 companies feel that the demand for hot rubber will continue. It is obvious that the better processing characteristics of hot rubber are a distinct advantage to many users both in the small and large consumer companies. Note that producer-consumers are about equally divided on this point.

TABLE 18. RUBBER WORLD QUESTIONNAIRE—CONSUMER REACTION—SBR RUBBER

5. The use of cold or LTP rubbers has increased steadily in the recent past. Do you consider that hot or 122° F. polymerized rubbers will eventually be completely replaced, or will there always be a demand for hot rubber? Comments?

Hot Completely Replaced	*28*
Hot Demand to Continue	*56*

Comments—Consumers

Favorable to All LTP: Cold rubber can do all our work. We believe that cold rubber should replace hot rubber because of its better physical properties.

Have no real need of hot rubber. Could use all cold type.

Favorable to Hot: Believe there will always be a demand for some hot rubber, particularly in carcass stocks and in some mechanicals.

We feel there will be a demand for hot rubber since it stands up better in extrusions and gives better aging qualities in non-black loaded compounds.

We would have some demand for hot rubber in fabric skimcoats because a softer compound is more readily made up with hot than cold rubber.

Comments—Producer-Consumers

About equally divided regarding complete elimination of hot rubber. Processing advantages of hot main reason for continued use in some instances.

Table 19 shows that 44 companies expect the use of oil-extended rubber to increase; 30 companies expect its use to continue at about the same level, and two companies expect its use to decrease. Improved quality seems to be desired, however, while the lower cost is still maintained. Problems in processing and fabrication seem to be major ones that need to be solved either by a better rubber or by improved fabricating techniques in the consumer's plant.

TABLE 19. RUBBER WORLD QUESTIONNAIRE—CONSUMER REACTION—SBR RUBBER

6. Oil-extended rubber is used to the extent of about one-third of the total rubber produced, but does not seem to be in demand beyond that level at the present time. Do you expect oil-extended rubber use to increase, decrease, remain constant during the next few years?

Increase	*44*
Remain Constant	*30*
Decrease	*2*

Comments—Consumers

Favorable to Increase: To increase if color of oils is more closely controlled.

Increase due to continued pressure from automotive industry for lower-cost rubber products.

Increase will be limited to success of development work aimed at improving the use of this-type rubber.

Remain Constant: Believe it is being used wherever possible. No expansion of use seen.

It is probable that the use of oil-extended rubber has reached its own correct level.

Adhesion of products under severe service conditions remains a problem.

Decrease: High-standard automotive specifications suggest decrease of the use of this-type rubber.

Comments—Producer-Consumers

Consumers in the major rubber companies were almost unanimous in stating that increased use of oil-extended rubber depends on improved quality and/or fabricating know-how.

Table 20 reports that 34 companies expect the use of carbon black masterbatches to increase; 29 expect it to remain constant, and four believe that this use will decrease.

The advantage of freedom from carbon black in the plant atmosphere when this masterbatch is used is appreciated, but apparently these masterbatches are not considered so good in quality as those mixed in the Banbury. In addition, the limitation of the number of different carbon black masterbatches available in comparison with the much larger number of carbon blacks that are available seems to be holding up SBR-carbon black masterbatch use. Consumers in the major companies do not generally look for a marked increase in the use of carbon black masterbatches unless some greater advantage in end-product quality can be demonstrated.

TABLE 20. RUBBER WORLD QUESTIONNAIRE—CONSUMER COMMENTS—SBR RUBBER

7. The use of carbon black masterbatches has ranged between 6% and 12% of the total production and is presently running at about 6%. Do you expect the use of carbon black masterbatches to increase, decrease, remain constant? Comments?

Increase	*34*
Remain Constant	*29*
Decrease	*4*

Comments—Consumers

Increase: With more uniformity in the carbon black masterbatches, the use will increase.

Our plants are cleaner as the result of our use of these masterbatches.

Expect considerable increase in use when these masterbatches are superior to those made by mixing black and rubber in dry form.

Remain Constant: The use of these masterbatches fixes the ratio of black to rubber. Although advantages for large-volume items such as tire treads, there are disadvantages when many compounds of varying black-to-rubber ratios are used in a fabricating plant.

Expect the use to remain constant with present grades. Improvement in the abrasion resistance of products using these masterbatches, if achieved by future development, might result in increased use.

Decrease: Unless more grades with different blacks are available, we would expect usage to decrease.

The economics are against the use of carbon black masterbatches except in specific applications.

Comments—Producer-Consumers

No increase in use expected unless marked superiority to Banbury mixed masterbatches can be demonstrated.

Table 21 indicates that 26 companies feel that the use of oil-black masterbatches will increase; 27 feel that their use will remain at its present level, and five expect use to decrease. Again it is a question of quality and fabricating know-how when using these masterbatches. Consumers in the major companies are again about equally divided between continued use at the present level or decrease unless improvements are made in this type.

TABLE 21. RUBBER WORLD QUESTIONNAIRE—CONSUMER REACTION—SBR RUBBER

8. Oil-black masterbatches have been used to about only 2% of the total production. Do you expect the production of this-type masterbatch to increase, decrease, remain constant? Comments?

Increase	26
Remain Constant	27
Decrease	5

Comments—Consumers

Increase: May increase as more know-how regarding the use of such masterbatches is developed.

Probably increase as use of oil-extended rubber increases.

Expect increased use, but will be dependent on new developments in connection with removing present obstacles to use in fabrication.

Remain Constant: The use of this type is limited at present.

Use limited by lack of flexibility of black-to-rubber ratio in fabricating plants with large number of compounds.

Decrease: We see no economic justification for oil-black masterbatch.

Comments—Producer-Consumer: About equally divided between continued use at present level and decreased use unless this type masterbatch is improved in quality so that it can be used with less difficulty.

Table 22 reports the results of an attempt to determine if consumers of SBR would switch sooner or later if the average price of natural rubber equaled that of SBR. Thirty-three companies expressed the opinion that they would continue to use SBR even though the economics became unfavorable, although it appears that many of these were those where SBR was preferred for technical reasons. Twenty-eight companies said that ownership by private industry was not a factor.

TABLE 22. RUBBER WORLD QUESTIONNAIRE—CONSUMER REACTION—SBR RUBBER

9. Now that synthetic rubber is entirely a private industry operation, would you replace the GR-S type with natural rubber at an equal price sooner, or later, than when it was produced under government control?

Sooner	7
Later	33
Ownership no factor	28

Comments—Consumers

Sooner: (Reasons not given.)

Later: Unless natural rubber can be purchased at 3¢ a pound lower than GR-S type, we would continue to use the GR-S type.

We get more production with GR-S type.

At an equal price natural rubber will not replace GR-S in its important uses.

Summary and Conclusions

In conclusion, I want first to quote from the President's Report and then from the Attorney General's Report as to what was considered to be the summary of finding for each of these reports.

The President's Report states, in part, in this connection:

"The free world capacity for production of synthetic rubber in 1956-1960, considering expansions of capacity proposed in the United States and contemplated elsewhere, should provide adequate synthetic rubber for requirements for synthetic projected for those years. It is to the long-term interest of natural rubber producers that supplies of natural rubber be available where needed. Lack of natural rubber would but force the further use of synthetics. . . .

"Broadly, the picture shows a certainty of increased world dependence on synthetic rubber for the next 10 years. Beyond that, if enough high-yield natural rubber is planted and comes into production, natural rubber can hope to recover a part of the position it will have meanwhile lost. The upward trend of world consumption will nevertheless apparently continue to make large use of synthetic rubber thereafter an economic necessity. Certainly progress will also be made in the development of superior synthetics more adequate as replacements of natural rubber than present types. The isoprene-based synthetic natural rubber may be but a link in a chain, leading to synthesized materials that eventually replace natural rubber entirely, in case supplies from the tropical regions were interrupted or reduced."

The Attorney General's Report is limited to an analysis of competition in the synthetic rubber industry during the eight-month period May through December, 1955. Comments under "Findings and Opinions" in this report, in part, follow:

"In commenting upon competition existing in the synthetic rubber industry in the first eight months of private ownership, I must point out that the operating experience of the industry under private enterprise has been inadequate to provide a basis for conclusion as to whether free and unfettered competition has been firmly established in this industry. In addition, the existence of a seller's market throughout most of the initial period of private ownership further complicates an evaluation of the character of the competition at this time. All producers were able to sell their entire output with ease, and, in the case of a majority of the producers, demand outran supply, forcing the allocation of GR-S among their customers. In this posture of the market such competition as did exist would have been found on the buying rather than on the selling side of the market. . . .

"I find, however, a number of factors favorable to the development and growth of competition in the synthetic rubber industry. Especially important in the evaluation of the presence and effectiveness of competition in this industry is the fact that there are 10 relatively strong GR-S producers. . . . At this juncture

it would appear that no producer has achieved what might be characterized as undue market influence. . . .

"On the other hand, however, I find that there are present in the industry some factors which may constitute impediments to the development of vigorous competition. Among these factors I note a tendency on the part of the producers to continue the pattern of product specialization which existed under government ownership when all the facilities were operated as an integrated whole. This pattern of production, if continued, would tend to insulate certain areas of production from the competition that would normally be expected to develop in a competitive industry. In this connection, I note that some producers have undertaken plant expansions which will further diversify their pattern of production, and it is hoped that this trend will be extended so that there will develop more effective competition in all types of GR-S produced.

"One of the tests of a competitive industry is the manner in which prices behave. In the short period of private operation of this industry I find what appears to be a tendency toward price inflexibility, a characteristic of industries in which there is a high degree of price administration. It is, however, premature to draw any conclusions at this time as to the specific character of synthetic rubber price behavior, since there have been no general price changes and those that have occurred have affected relatively minor items of production.

"The stability of synthetic rubber prices during the survey period, when demand exceeded supply and natural rubber prices reflected the influence of world demand, tends to indicate that the price policy adopted by the producers brings about a result closely paralleling the behavior of prices under government ownership. The lack of sensitivity of GR-S prices to the forces of supply and demand may, therefore, indicate that all vestiges of government monopoly have not yet been completely eliminated from the synthetic rubber market. It is to be hoped that over the long term GR-S prices will tend more to reflect the influence of supply and demand as well as the economies of production which should obtain under the stimulus of competitive free enterprise.

"In my opinion on the sale of the butyl rubber plants to affiliates of Standard Oil Co. (N. J.), I stated that, with the safeguards provided and under the circumstances then prevailing, the sale would best foster the development of a free competitive synthetic rubber industry. The experience of the first eight months of private ownership has justified my expectation. In addition, the loss of a part of the major market for butyl rubber has introduced new elements of competition which tend to relieve some of the doubts held concerning competition in this branch of the synthetic rubber industry at the time of disposal.

"And, finally, I am led to the conclusion that during the survey period the small rubber fabricators have obtained a fair share of the synthetic rubber produced and at fair prices. Despite an acute shortage of synthetic rubber in the latter part of 1955, small rubber fabricators were able to obtain supplies that were adequate to meet their needs. In addition, the performance of the producers under their contractual commitments to set aside a portion of their production for the benefit of small business, indicates that, on the whole, they exceeded their commitments during the survey period."

I want to make the following points from the RUBBER WORLD investigation and a consideration of the facts revealed therefrom:

1. There is a genuine need of universally acceptable generic names and abbreviations for not only styrene-butadiene rubber, but for all other commercial rubbers. Scientists, technologists, salesmen, purchasing agents, and all those in the rubber industry that have to work with these rubbers should be able to speak the same language if unnecessary confusion and expense are to be avoided.

2. The world and the United States rubber industry will climb to new heights of production and sales between now and 1960. The climb will not be at a regular rate; we will have peaks and valleys as before, but the extent of these variations from the average during 1956-1960 will be less owing to the stabilizing effect of a large present and future capacity to produce synthetic rubber.

3. Natural rubber production and demand will be about in balance during the 1956-1960 period while world and United States demand for new rubber will increase from 2.9 million tons to 3.6 million tons and 1.5 million tons to 1.7 million tons, respectively. There may be a "margin of safety" of about 500,000 tons of synthetic rubber production capacity available beginning in 1956 to take care of any increase in demand beyond that presently estimated and to allow for continued growth of the industry.

4. Expansion plans of SBR producers will provide most of the planned additional capacity by the end of 1957, as will the plans of the producers of neoprene and nitrile rubbers. Expansion plans of butyl producers are somewhat less definite and are dependent on the successful development of both transportation and non-transportation uses where this rubber will replace natural rubber. Expansion of capacity for the production of polyisoprene will most likely depend on its value as a strategic replacement for natural rubber and the economics of its production and use. Polyurethane rubber and foam production and use will grow as these materials demonstrate advantages over natural rubber and certain synthetics.

5. LTP-SBR use will increase at the expense of the regular or hot SBR, but a minimum of at least 10% of the total SBR will continue as hot rubber for some time to come.

6. The use of oil-extended SBR may grow to 50% of the total SBR used, *if* improvements in the quality of this rubber and better fabricating techniques are developed in the consuming plants.

7. The growth of the use of carbon black-SBR masterbatches also depends on the improvement of the quality of this rubber, with special reference to better dispersions of a greater variety of carbon blacks in the rubber.

8. The growth of the use of oil-black SBR masterbatches is primarily dependent on improvements in the

(Continued on page 421)

Highly Stabilized Non-Discoloring Rubber Compositions[1]

By D. BRUCE MERRIFIELD
Monsanto Chemical Co., Nitro, W. Va.

Non-discoloring and non-staining rubber compositions with good processing characteristics, as measured by scorch and vulcanization rates, and with a high level of ozone and oxidation resistance result from the use of dithioamine accelerators in combination with sterically hindered hydroquinones.

Sterically hindered phenols were found to be less effective than hydroquinones as antidegradants. The term "antidegradants" is used instead of antioxidant because the materials and systems described provide resistance to ozone, flex-cracking, heat build-up, etc., in addition to resistance to oxygen.

CONVENTIONAL aromatic amine antidegradants[2] provide better protection to rubber systems than do relatively non-discoloring, but only moderately active phenolic antidegradants. These amines, however, cannot be used in white rubber or rubber used adjacent to painted surfaces where migration, staining, and discoloration may occur. A need, therefore, exists of high-level protection combined with non-discoloring characteristics.

Results of olefin oxidation studies published in recent years and outlined in the discussion section have led to the use of dithioamine vulcanized systems (1)[3] to obtain this objective. A white sidewall formulation has been used as the vehicle for these studies.

Experimental Details

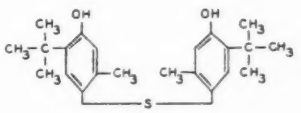
Table 1 illustrates the natural rubber white sidewall base formulation used for these studies. Conventionally vulcanized control formulations are illustrated by Stock A in Table 1. Dithioamine vulcanized experimental formulations are illustrated by Stock B. Banbury mixing, milling, curing, and testing procedures were carried out in accordance with ASTM[4] specifications or as otherwise noted in Table 2. Chemicals and materials used are also identified in Table 2.

TABLE 1. BASE AND STOCK FORMULATIONS USED

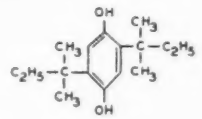
Base Formulation	
Pale crepe	100.0
Titanium dioxide	50.0
Zinc oxide	25.0
Clay	15.0
Stearic acid	1.0

Stocks	A	B
Sulfur	3.0	—
2,2'-Dithiobisbenzothiazole	0.6	—
Diphenylguanidine	0.15	—
Antidegradant	1.5	1.5
4,4'-Dithiodimorpholine	—	3.5
Benzothiazole accelerator	—	0.5
Lead stearate	—	0.02

Four antidegradants of three different types were used in these studies. Antioxidants A and B are experimental sterically hindered bis phenols; Santowhite Crystals is a commercially available thio-bis phenol, and Santovar A



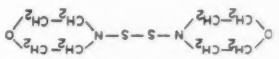
SANTOWHITE CRYSTALS



SANTOVAR A

is a hindered hydroquinone. The latter material is normally used as an antidegradant in non-vulcanized systems such as adhesives, but not in sulfur vulcanized systems such as those discussed here. Combinations of these four materials with a dithioamine vulcanized stock (Sulfasan R) result in high-level antiozonant and anti-

SULFASAN R



oxidant activity. Improvements in antiozonant activity of these combinations over that of conventional formulations are of particular interest and are illustrated in Figure 1.

Ozone Resistance

None of the four antidegradants provided resistance to ozone attack in a conventional formulation, but all of them had activity in a dithioamine stock over and above

[1] Presented before the Division of Rubber Chemistry, ACS, Philadelphia, Pa., Nov. 3, 1955.
Contribution from Monsanto Chemical Co., Organic Chemicals Division, Nitro, W. Va.
[2] "Antidegradant" is used in preference to antioxidant since the system described appears to provide not only conventional antioxidant activity, but also antiozonant, anti-flex, anti-heat build-up, and anti-compression set activity.
[3] Numbers in parentheses refer to Bibliography items at end of article.
[4] American Society for Testing Materials, Philadelphia, Pa.

The Author

D. B. Merrifield has been a polymer research chemist at the Nitro Research Department of the Organic Chemicals Division of Monsanto Chemical Co. at Nitro, W. Va., since 1950. Also, he was employed by Monsanto for about a year during the 1942-43 period, prior to entering the service. He received his bachelor's degree in chemistry from Princeton University in 1942 and his doctorate from the University of Chicago in 1950. From 1943 until 1946, he was a flyer in the Marine Air Corps.

Dr. Merrifield is a member of Sigma Xi and the American Association for the Advancement of Science.

TABLE 2

A. Test Methods, Equipment and Procedures

1. Base formula mixing	Type 00 Banbury	ASTM D15-54T
2. Addition of variables	6- by 12-inch mill	ASTM D15-54T
3. Stress strain	Scott tensile tester	ASTM D412-51T
4. Hardness	Shore "A" durometer	ASTM D314-52T
5. Mooney scorch	Mooney viscometer	ASTM D1077-49T (1 + 10) at 135° C.
6. Aging	Air oven	ASTM D573-53, 100°C.
7. Ozone	Indoor dynamic exposure tester (2)	25 pphm ozone, dynamic, reference rating is Santoflex AW = 100
8. Firestone flexing	Firestone sidewall flexer	100% elongation of dumbell strips, kilocycles to rupture at 30° C., 300 cycles/-min.
9. Discoloration	Sunlight bulb, RS Type 275 W	ASTM D1148-51T

B. Compounding Ingredients

1. Rubber	Thick Pale Crepe IX (Superior)	Charles T. Wilson Co., Inc.
2. Titanium dioxide	Rayox	R. T. Vanderbilt Co.
3. Zinc oxide	Protex 166	New Jersey Zinc Sales Co.
4. Suprex* Clay		J. M. Huber Corp.
5. Stearic acid	Double Pressed Pearl	C. P. Hall Co.
6. Sulfur	Rubbermaker's	Stauffer Chemical Co.
7. N-cyclohexyl-2-benzothiazole-sulfenamide	Santocure(†)	Monsanto Chemical Co.
8. 2-Mercapto-benzothiazole		Monsanto
9. 4,4'-Dithiodi-morpholine	Sulfasan(†) R	Monsanto
10. Lead stearate		Sherwin Williams Co.
11. 4,4'-Thiobis 6-tertbutyl-m-cresol)	Santowhite(†) Crystals	Monsanto
12. Diphenylguanidine		Monsanto
13. 2,5-Di-tert-amyl-hydroquinone	Santovar(†) A	Monsanto
14. 6-Ethoxy-1,2-dihydro-2,2,4-trimethylquinoline	Santoflex(†) AW	Monsanto

*Registered trade mark of J. M. Huber Corp.
†Registered trade mark of Monsanto Chemical Co.

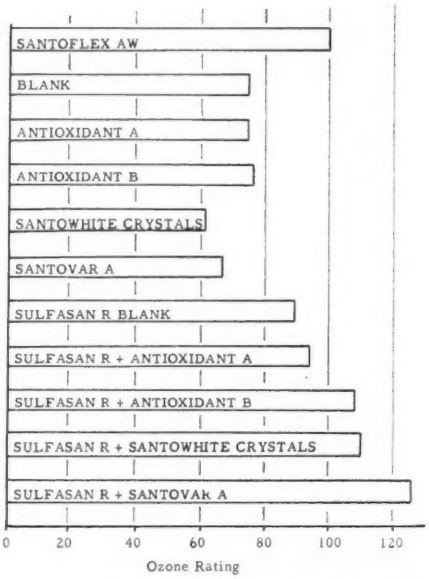


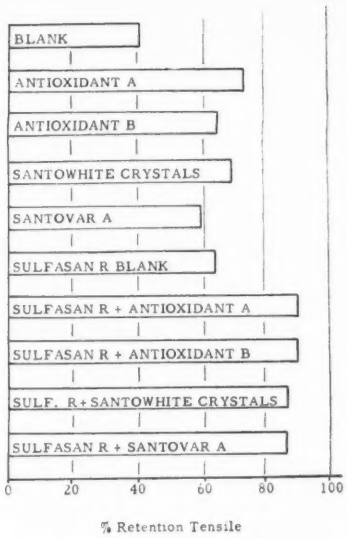
Fig. 1. Dynamic ozone resistance of dithioamine and conventionally vulcanized white sidewall formulations

that of a blank dithioamine control. Santovar A, which provided the least contribution to ozone resistance in a conventionally vulcanized stock, provided the most in a dithioamine stock. Ozone tests were made using an indoor dynamic apparatus described by Creed, Breed, and Hill (2), at an ozone concentration of 25 parts per hundred million.

Santoflex AW, a commercial tread-stock antiozonant was used as an arbitrary reference standard with a rating of 100. Santoflex AW is badly discoloring in a white stock. The dithioamine vulcanized stock containing Santovar A provided considerably better protection against ozone attack than that provided by Santoflex AW in a conventionally vulcanized stock at equal weight concentrations of the two antidegradants.

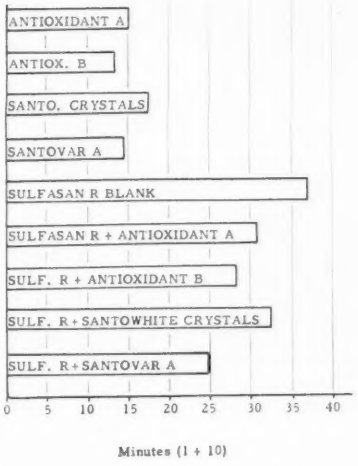
Air Aging

Figure 2 illustrates air-oven aging resistance provided by each antidegradant in both a conventional and a



(Far Left)

Fig. 2. Air-oven aging of dithioamine and conventionally vulcanized white sidewall formulations



(Left)

Fig. 3. 135° C. (275° F.) Mooney scorch delay of dithioamine and conventionally vulcanized white sidewall formulations

(Below)

Fig. 4. 300% Modulus curves for dithioamine vulcanized white sidewall formulations

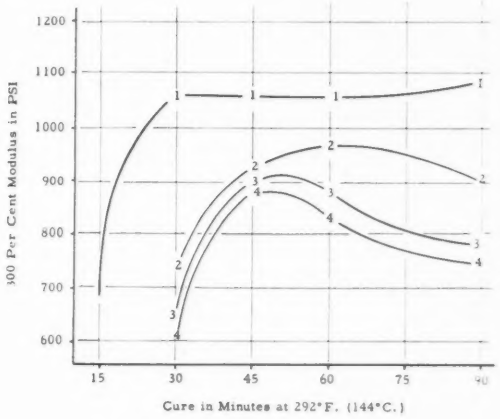
Sulfasan R formulation. The Sulfasan R stock containing no antidegradant at all retained 64% of its original tensile strength after air-oven aging 96 hours at 100° C. Within experimental reproducibility, this value is roughly comparable to retention values obtained using a conventional formulation containing an antidegradant. Dithioamine formulations containing antidegradants, however, permitted from 84 to 88% retention of tensile under the same conditions. Differences among individual antidegradants in dithioamine stocks are too slight to be significant.

Scorch and Vulcanization

Figure 3 illustrates scorch delay obtained at 135° C. (275° F.) with Sulfasan R formulations as compared with conventional formulations. Sulfasan R formulations provide a considerable improvement in processing safety. The blank stock containing no antidegradant is actually too delayed, and addition of antidegradants materially reduces this delay to a more desirable optimum. A balance between preliminary delay and time required to reach optimum vulcanization is necessary; these relations for Sulfasan R are indicated by the stress-strain curves, Figures 4, 5, 6, and 7.

Figure 4 shows the effect of time of vulcanization upon 300% modulus for dithioamine stocks. Stock 1 containing Santovar A shows no vulcanization after 15 minutes at 144° C., (292° F.), but rapidly reaches an optimum at 30 minutes. This is an exceptionally fast rate of vulcanization, as indicated by the steep slope of the curve, and is combined with excellent preliminary delay. At 30 minutes, the curve levels off and is almost flat to 90 minutes. Stocks 2, 3, and 4 containing the other antidegradants show no vulcanization up to almost 30 minutes and then reach optimum levels between 45 and 60 minutes. It would appear that these stocks are too delayed for many purposes. Moreover the curves beyond 30 minutes are not so flat as the curve for Stock 1.

By comparison with dithioamine stocks, Figure 5 shows the 300% modulus curves for conventionally vul-



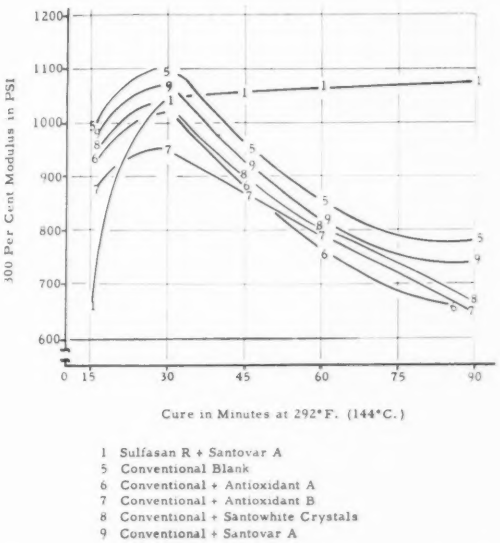


Fig. 5. 300% Modulus curves for conventionally vulcanized white sidewall formulations

canized stocks. These stocks have little preliminary delay and reach an optimum level of vulcanization at the same point obtained with the Sulfasan R (Stock 1) formulation. Beyond 30 minutes, however, the conventional stocks quickly fall several hundred psi, in contrast to the Sulfasan R Stock 1, which remains level.

Figures 6 and 7 show tensile curves for dithioamine and conventional formulations. The Sulfasan R stock containing Santovar A gives a higher ultimate tensile at the optimum point of vulcanization than do the other Sulfasan R stocks, but subsequently falls to a lower level at 90 minutes. In Figure 7 the Sulfasan R-Santovar A formulation gives a higher level of ultimate tensile than

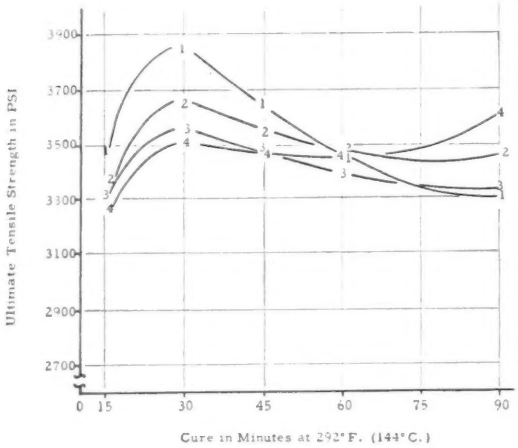


Fig. 6. Ultimate tensile curves for dithioamine vulcanized formulations

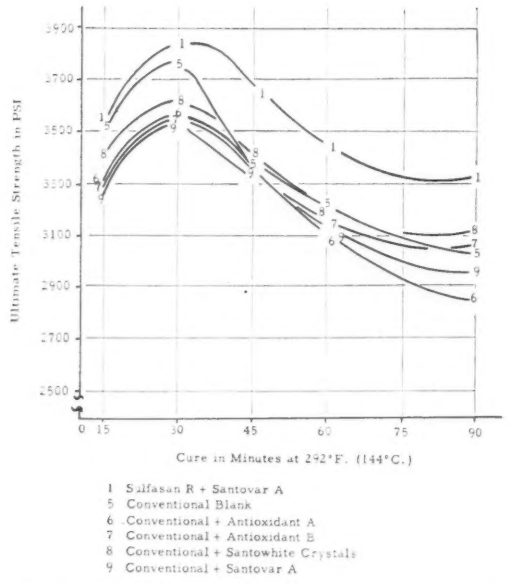


Fig. 7. Ultimate tensile curves for conventionally vulcanized white sidewall formulations

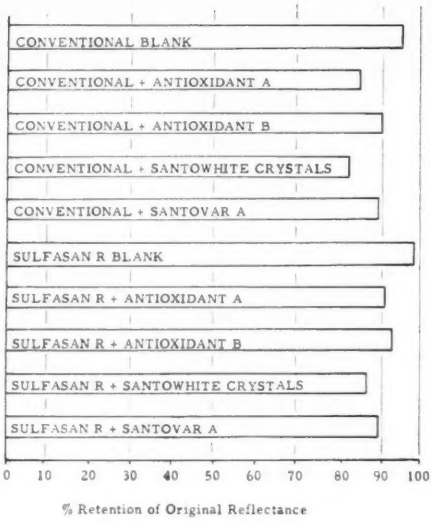

CONVENTIONAL BLANK
CONVENTIONAL + ANTIOXIDANT A
CONVENTIONAL + ANTIOXIDANT B
CONVENTIONAL + SANTOWHITE CRYSTALS
CONVENTIONAL + SANTOVAR A
SULFASAN R BLANK
SULFASAN R + ANTIOXIDANT A
SULFASAN R + ANTIOXIDANT B
SULFASAN R + SANTOWHITE CRYSTALS
SULFASAN R + SANTOVAR A
0 10 20 30 40 50 60 70 80 90 100
% Retention of Original Reflectance

Fig. 8. Resistance to discoloration of dithioamine and conventionally vulcanized white sidewall formulations

do the conventional formulations, but they all appear to fall off at about the same rate from the optimum point.

Discoloration

Figure 8 compares resistance of conventional and Sulfasan R formulations to discoloration after a 10-day exposure to an RS lamp. Differences which appear between individual antidegradants in either formulation are relatively small. Ratings are made in terms of % retention of original reflectance as measured by a Photovolt reflectance meter.

Flex Life

Flex life measurements on a Firestone sidewall flexer are illustrated in Figure 9. Initial unaged flexure is better for conventional stocks than for a dithioamine stock containing Santovar A. However, when the flex specimens are pre-aged for periods of 24, 48, 72, and 96 hours at 100° C. in an air oven and then flexed, the dithioamine stock ultimately appears to be best.

Oxygen and Ozone Resistance

Traces of lead stearate added to Sulfasan R-Santovar A formulations were found to enhance the aging and ozone resistance of these stocks. Figure 10 illustrates this effect for 0.02-part of lead stearate added per hundred parts of rubber hydrocarbon. No discoloration caused by formation of lead sulphide was observed at anytime.

Figure 11 illustrates the effect of substituting a sulfenamide accelerator for MBT (see also Table 1) in a Sulfasan R formulation. Equivalent ozone protection, but a lower degree of aging resistance is obtained when the sulfenamide is used. This result is in line with the acknowledged aging advantages of MBT.

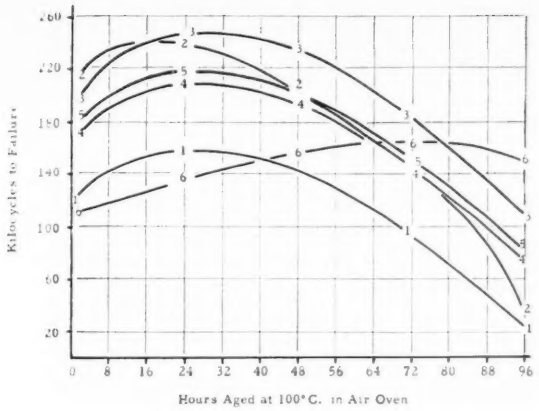
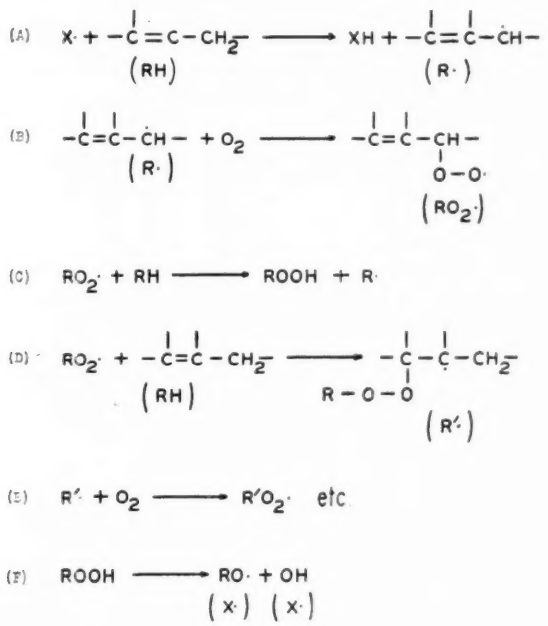


Fig. 9. Firestone sidewall flexure of dithioamine and conventionally vulcanized white sidewall formulations

Discussion

Results of olefin oxidation studies published in recent years (3-6) indicate that deterioration of olefinic hydrocarbons, such as natural rubber, primarily occurs through free radical mechanisms. Inhibition of these free-radical chain reactions is postulated to be possible using free-radical chainstoppers or materials which decompose hydroperoxide intermediates in the chain reaction. These postulates have led, as described below, to the investigation of the dithioamine systems discussed in this paper.

The generally accepted mechanism of free-radical initiated air oxidation of olefinic hydrocarbons is:



Decomposition of the hydroperoxide (F) and addition of $RO_2\cdot$ to a double bond (D) are presumed to be the slow steps in this sequence. Interference at either or both points is postulated to inhibit degradation.

Phenolic antidegradants are postulated (7-11) to inhibit degradation by interrupting the double-bond addition step (D), with resulting formation of peroxides.

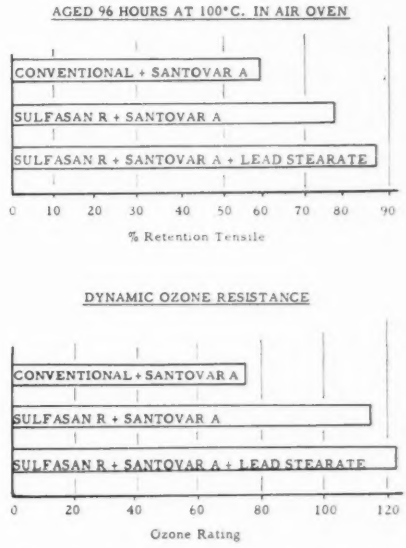

AGED 96 HOURS AT 100°C. IN AIR OVEN
CONVENTIONAL + SANTOVAR A
SULFASAN R + SANTOVAR A
SULFASAN R + SANTOVAR A + LEAD STEARATE
0 10 20 30 40 50 60 70 80 90
% Retention Tensile
DYNAMIC OZONE RESISTANCE
CONVENTIONAL + SANTOVAR A
SULFASAN R + SANTOVAR A
SULFASAN R + SANTOVAR A + LEAD STEARATE
0 20 40 60 80 100 120
Ozone Rating

Fig. 10. Effect of lead stearate on aging and ozone resistance of a Sulfasan R-Santovar A white sidewall formulation

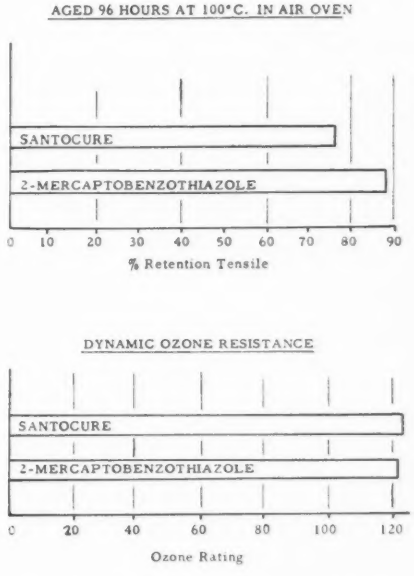
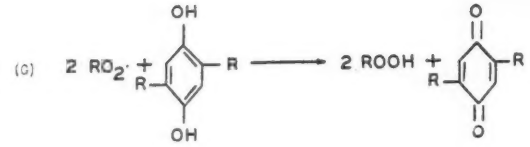
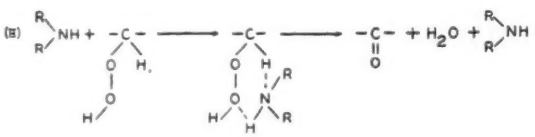


Fig. 11. Effect upon ozone resistance and air-oven aging of substitution of Santocure for MBT in a Sulfasan R-Santovar A white sidewall formulation

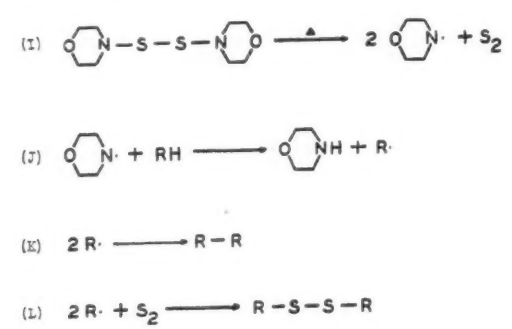


These hydroperoxides and others formed in step (C) can lead to further free radical chains (F). However, Shelton and Cox have postulated (12) that secondary amines decompose hydroperoxides through the formation of quasi six membered rings:



Therefore, a combination of a secondary amine and a phenolic antidegradant might be expected to result in improved resistance to degradation.

Dithioamine systems were selected for investigation because thermal decomposition of these substances is postulated to result in the ultimate liberation of a secondary alkyl amine.

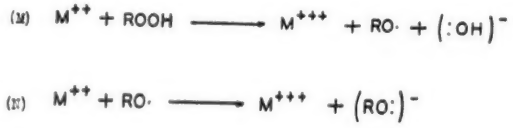


Such a reaction sequence also accounts for vulcanization in the absence of elemental sulfur. The morpholyl free radicals which are liberated are presumed to stabilize themselves by extracting a hydrogen atom from the rubber hydrocarbon. Vulcanization then possibly occurs either by dimerization of resulting hydrocarbon free radicals or by a cross-linking mechanism involving liberated sulfur. Alkylamines such as morpholine have good antioxidant and antiozonant properties in natural rubber, but are much too scorch-activating to be used by themselves in conventional formulations. Incorporation into the system as part of a dithioamine would appear to afford a practical solution to non-elemental sulfur scorch-delayed vulcanization while safely introducing an amine for subsequent antidegradant purposes.

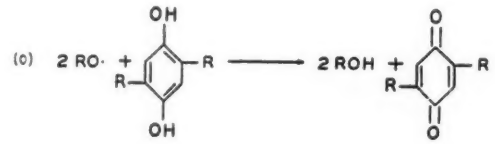
The results obtained tend to substantiate these postulates. It is therefore presumed that the morpholine is primarily acting as a decomposition agent for hydroperoxides; while Santovar A is effectively acting as a free-radical chain-stopper. A relatively high level of aging and ozone resistance results without discoloration.

The activity of Santovar A in a dithioamine system is interesting in view of its poor performance in a conventionally vulcanized sulfur system. The measure of antidegradant efficiency is given, however, by a balance between sensitivity as an antidegradant and susceptibility to destruction (13). Hydroquinones are much more susceptible to oxidation than phenols, and sulfur-containing systems are strongly oxidizing. Possibly, a conventional sulfur-containing system therefore largely destroys a hydroquinone such as Santovar A during vulcanization; whereas the more stable phenols are not so rapidly destroyed. In a dithioamine system containing no elemental sulfur the probability of destruction is diminished, and the hydroquinone may persist for later anti-degradant use.

Use of trace amounts of a metal salt such as lead stearate is also of interest. Metal salts are postulated to decompose hydroperoxide (14-15):



and alternately to (N), the following might also occur:



A combination of an antidegradant and a suitable metal salt might be expected therefore to result in enhanced antidegradant activity. Such appears to be the case in a dithioamine system.

Vulcanization characteristics of dithioamine systems are noteworthy. Not only do these systems have unusual scorch delay, but once started, their rate of vulcanization is more rapid than that of conventional systems. The combination of these two features permits excellent processing safety without sacrificing time to optimum cure. An unusually flat 300% modulus plateau, from 30 to 90 minutes' vulcanization time, also provides a wide margin of manufacturing safety.

Summary and Conclusions

Dithioamines have been investigated in white sidewall formulations as scorch-delayed vulcanizing agents which, in combination with a sterically hindered hydroquinone, impart a high level of ozone and oxidation resistance to rubber. The systems are non-discoloring and non-staining.

Sterically hindered phenols were found less effective than a hydroquinone as antidegradants, but a trace of lead stearate was found to enhance the antidegradation characteristics of the stock. Free-radical mechanisms are postulated to explain partially the results obtained.

Acknowledgments

The author is indebted to C. L. Gable, R. O. Zerbe, and M. C. Throdahl for critical review of the manu-

script and many helpful suggestions. The capable assistance of W. B. Yates, D. B. Graves, and Miss Patricia Martin is also gratefully acknowledged.

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GR-S Trends

(Continued from page 414)

oil-extended and carbon black rubbers since oil-black rubber is a combination of these two.

9. Apparently most consumers of SBR will base their continued use on the price relation between natural and SBR, except for those consumers where SBR is preferred for technological reasons. A significant minority may stay with SBR even at a somewhat higher price, however, because of the dependability of supply and the technical assistance provided.

10. Ample supplies of new rubber will be available during the next five years, and additional supplies of natural rubber beginning about in 1961. If the advancing standard of living both in the United States and abroad supplies the demand, most of this new rubber will be used, and the rubber producing and consuming industries will enjoy a decade of business activity not heretofore experienced.

NBS Devises Fast Analysis of Natural/GR-S Vulcanizates

A rapid, convenient method for determining natural rubber in vulcanizates of GR-S and natural rubber has been developed by the National Bureau of Standards, United States Department of Commerce, Washington, D. C.

Based on studies by M. Tryon, E. Horowitz, and J. Mandel,[1] of the NBS staff, the procedure involves thermal decomposition of the vulcanizates and infrared spectroscopic analysis of the resulting products. According to NBS, this method will make possible performing quantitative analyses of polymeric materials that have defied analysis because of their insoluble nature or the presence of interfering fillers.

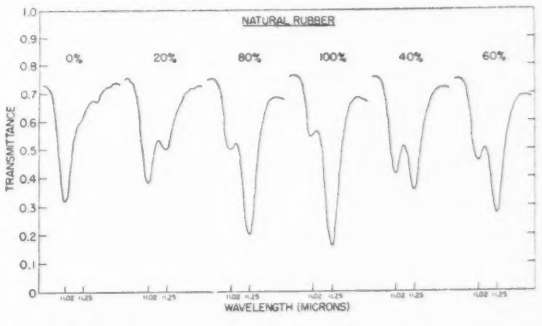
Previous methods for quantitative estimation of natural rubber in vulcanized samples have been difficult and time consuming and were subject to large cumulative errors, the Bureau says. The new technique requires about 15 minutes for completion, compared to four or more hours for the old analytic procedures.

In the NBS method the sample is milled and extracted with acetone, and the solvent removed by vacuum drying. A 0.5-gram specimen is pyrolyzed in a modified combustion furnace at 550° C. One or two drops of the liquid distillate are placed between two sodium chloride windows having a lead space 0.025-millimeter thick.

Each liquid distillate obtained upon pyrolysis is analyzed with a recording spectrophotometer using sodium chloride optics. The concentration of natural rubber is determined by comparing the relative intensity of absorption bands at wavelengths characteristic of natural rubber and GR-S. These bands are 11.25 microns for natural rubber and 11.02 microns for GR-S.

In the course of his analysis, the operator uses a calibration curve relating the ratio of transmittances of GR-S and natural rubber to the concentration of natural rubber. The work has established that the log of this ratio is nearly a linear function with respect to the concentration of natural rubber, based on the total polymer weight.

This method should also be of value in more fundamental studies of polymer degradation and depolymerization, NBS declares. Here it could be used to obtain additional data on pyrolysis products unsuited to mass spectrometry.



Infrared spectra of rubber samples studied at the National Bureau of Standards. As the percentage of natural rubber increases, there is an increase in the intensity of the absorption band at 11.25 microns and a corresponding decrease at 11.02 microns

[1] *J. Research NBS*, 55, RP 2623 (1955).

EDITORIAL

"A New Force for Inflation"

A RECENT report by the National Association of Manufacturers entitled, "A New Force for Inflation," by Ralph Robey, economic advisor to the NAM, makes a lot of sense for the manufacturing industry in the United States in general and the rubber industry in particular. Inflation is defined as an increase in the money supply of an economy out of proportion to the amount of goods and services available for purchase.

The NAM points out that in recent years this new force for inflation has appeared in nearly all of the industrialized nations of Western Europe and also in the United States. It stems from a characteristic of a free modern industrial society, the tendency for wage rates to grow without any definite or normal relation to market conditions. *As a case in point in the rubber industry, we have the United Rubber, Cork, Linoleum & Plastics Workers of America, AFL-CIO, asking for another "substantial" wage increase this year, after having been granted such wage increases more or less regularly for the past several years.*

It is explained that in recent years the United States has experienced an inflation of the traditional type resulting from government deficits. Much of the government's debt entered the commercial banking system and became the basis for an increase in the money supply. In the period 1939-1955, the actual expansion in the money supply amounted to a 280% increase.

A vast reservoir of money was available, therefore, to permit a growing volume of business transactions to be handled at higher prices. In this inflationary situation, international unions in the mass-production industries were able to demand and get wage increases for their members in excess of productivity increases, without causing an economic downturn.

Physical output per manhour in manufacturing increased by 28%, while pay received by the workers increased 180% during the period 1939-1953, according to the Bureau of Labor Statistics.

One of the most important points made in the NAM report is that the economy now has built up to the inflated money supply as a result of increased volume at higher prices, and there is no further room for higher labor costs per unit of production to be absorbed. If labor costs are increased beyond gains in productivity, the economy may become unbalanced through the necessity of further increases in money supply beyond that required for normal economic growth, which will start us again on the road to inflation.

If this danger is to be avoided, wage increases must be restricted company by company to increases in productivity. Gains in productivity should not all go to labor, but rather should be divided three ways, to labor for its increased efficiency, to investors for the more effective tools and machines their savings provide, and to consumers through price reductions of the products which are being manufactured with these improved tools.

The only way to stay on the orderly road to economic growth and avoid the peril of inflation on one hand and the evils of unemployment on the other is to share the benefits of this growth in the three ways mentioned above. *Management and labor in the rubber industry would do well to give these facts serious consideration in their forthcoming wage talks.*

R. G. Seaman

EDITOR

Meetings and Reports

Cleveland Rubber Division Registration 1,300; Cadwell 1956 Goodyear Medalist

Attendance at the Cleveland meeting of the Division of Rubber Chemistry of the American Chemical Society, held at the Hotel Cleveland, Cleveland, O., May 16-18, equaled that of the previous record established only last November in Philadelphia, when 1,303 members and guests were present. The Cleveland meeting was featured by an excellent program of technical papers, an invited paper on the Division's activities during the 1919-1927 period by Arnold H. Smith, Division secretary at that time, the announcement of the selection of S. M. Cadwell, United States Rubber Co., as 1956 Goodyear Medalist, and the nomination of officers and directors for 1957.

The technical sessions began on the afternoon of Wednesday, May 16, with Division Chairman A. E. Juve, The B. F. Goodrich Co., presiding. The luncheon-meeting of the Division's 25-Year Club was held on the same day. The business meeting and the presentation of the invited paper by Mr. Smith took place on Thursday morning, and the Division banquet was held on Thursday evening. Of special interest was the presentation of papers by L. C. Bateman, British Rubber Producers' Research Association; and C. H. Leigh-Dugmore, Dunlop Research Center, both of England.

No plant trips were planned for the Cleveland meeting because of the heavy schedule of technical papers. A special program for the approximately 45 women registrants, including a luncheon and fashion show, was arranged. Much of the success of the Cleveland meeting must be attributed to the work of the local arrangements committee headed by C. A. Smith, N. J. Zinc.

25-Year Club Luncheon Meeting

There were 196 members and guests at the luncheon-meeting of the 25-Year Club on May 16. F. W. Stavely, Firestone Tire & Rubber Co., was the chairman and introduced E. W. Madge, Dunlop Rubber Co. of England, and E. G. Holt, Chemical & Rubber Division, United States Department of Commerce, present as guests at the meeting.

Fifteen new members of the Club introduced themselves to the members. Dr. Stavely then asked the members to stand for a moment of silent tribute for members of the Club who had passed on since the last meeting. These members were George Oenslager, retired, from Goodrich; Ernst A. Hauser, Massachusetts Institute of Technology; H. V. Powers, C. P. Hall Co.; E. H. Grafton, Tompkins Rubber Co.; and W. Y. Duncan, retired.

It was mentioned that new members of the 25-Year Club could obtain lapel pins from Godfrey L. Cabot, Inc., Boston, Mass., by addressing Owen Brown of that company. These pins have been prepared and distributed for several years to the members of the Club as a courtesy gesture by the Cabot organization.

Dr. Stavely then announced that Ernest R. Bridgwater, elastomers division of E. I. du Pont de Nemours & Co., Inc., would be the chairman for the 25-Year Club luncheon-meeting in Atlantic City, N. J., in September.

Mr. Bridgwater conducted the elimination contest to find the member present with the longest record of service in the rubber industry who had not been so designated at a previous meeting of the 25-Year Club. It was found that there were three members with 47 years of service present, and it was necessary to determine by the month each one entered the industry which one had the longest service. This honor went to Albert W. Holmberg, Naugatuck Chemical Division, U. S. Rubber, and he was then presented with a suitable memento of the occasion.

The Business Meeting

At the business meeting on the morning of May 17 presided over by Chairman Juve, the chairman of the membership committee, H. W. Hoerauf, U. S. Rubber, reported that the Division now had 2,432 voting members, an increase of 132 over the voting membership of November, 1955. Members and associate members of the Division amount to 2,962.

It was announced that Ralph F. Wolf, Columbia-Southern Chemical Corp., had been appointed chairman of the new Rubber Division Library Policy committee, and that Lois Brock, The General Tire & Rubber Co., had been appointed chairman of the operating committee.

It was also announced that David Craig, B. F. Goodrich Research Center, had become the new associate editor of *Rubber Chemistry and Technology*.

The award for the best paper presented at the November, 1955, Philadelphia meeting of the Division was presented to J. P. McKenzie, Copolymer Rubber & Chemical Corp., by Chairman Juve. The co-author of this paper, J. D. Sutherland of the same company, was unable to be present so that Mr. McKenzie accepted the award for both Mr. Sutherland and himself.

Alfred J. Northam, Du Pont, will be the chairman of the local arrangements committee for the next meeting of the Division, scheduled for September 19-21, at Chalfonte-Haddon Hall in Atlantic City.

Chairman Juve mentioned that consideration is being given to an international meeting to be held in Washington, D. C., during the week of November 8-13, 1959. This meeting will be dependent on the decision of the International Standards Organization, Technical Committee 45 on Rubber, to hold its meeting in the United States in 1959. Tentative plans call for a one-week meeting of ISO/TC 45 either prior to or after the Rubber Division, ACS, meeting, in which that organization would join with Committee D-11 on Rubber of the American Society for Testing Materials and the Rubber & Plastics Division of the American Society of Mechanical Engineers for another week of meetings which would be an international rubber technology conference. The Rubber Division, ACS, meeting in Washington, in November, 1959, is a regularly scheduled meeting of three days, whether or not the international rubber technology conference is held. ASTM Committee D-11 would have a one-day program, and the Rubber & Plastics Division, ASME, would have a one-day program to complete the five-day conference. It is expected that some information on the decision of ISO/TC 45 to hold its meeting in the United States in 1959 will become available in June or July of this year.

The members were asked to stand for a moment of silent tribute for the following members who have passed on since the last meeting of the Division: E. H. Grafton; T. E. Boyle, International B. F. Goodrich Co.; H. V. Powers; D. F. Brown, Esso Research & Engineering Co.; R. P. Cosgrove, Firestone Tire & Rubber Co.; George Oenslager; Ernst A. Hauser; F. W. Bommer, Acushnet Process Sales Co.; and E. D. Youmans, Okonite Co.

John Ball, chairman of the Goodyear Medal Award committee, reported that Sidney M. Cadwell, director of research and development, U. S. Rubber, had been selected as the 1956 Goodyear Medalist of the Division for his pioneer research in rubber accelerators and antioxidants. The presentation will be made at the Atlantic City meeting on September 20.

J. H. Fielding, Armstrong Rubber Co., chairman of the nominating committee, then reported his committee's selection for officers and directors of the Division for 1957, as follows: chairman, B. S. Garvey, Jr., Sharples Chemicals Division, Pennsylvania Salt Mfg. Co.; vice chairman, J. D. D'Ianni, Goodyear, and R. F. Dunbrook, Firestone; secretary, A. M. Neal, Du Pont; and treasurer, George E. Popp, Phillips Chemical Co. Nominations for directors from the areas of the sponsored local rubber groups were given as: Akron, D. F. Behney, Harwick Standard Chemical Co., and K. R. Garvick, Mansfield Tire & Rubber Co.; Boston, T. C. Edwards, Acushnet Process Co., and H. W. Sutton, Boston Woven Hose & Rubber Co.; Buffalo, P. J. Sick, Hewitt-Robins, Inc., and R. E. Schutz, Buffalo Weaving & Belting Co.; Chicago, J. E. A. Hopkins, Johns-Manville Corp., and V. J. Labrecque, Victor Mfg. & Gasket Co.; Fort Wayne, H. C. Rapp, Belden Mfg. Co., and D. Sherman, U. S. Rubber; Los Angeles, R. E. Bitter, B. F. Goodrich

Chemical Co., and R. G. Luskin, Goodyear Chemical Division; New York, S. M. Martin, Jr., Thiokol Corp., and C. V. Lundberg, Bell Telephone Laboratories; and for the first time from Canada, N. S. Grace, Dunlop Tire & Rubber Co. Ltd., and G. R. Smye, Firestone Tire & Rubber Co., Ltd.

The Technical Sessions

Abstracts of the paper presented before the technical sessions were published in the April issue of RUBBER WORLD. Certain additional comments on some of these papers may now be made.

R. G. Arnold, of Du Pont, in the first paper, explained that the primary reactions of isocyanates with alcohols, amines, and water are often accompanied by side reactions, many of which had not been recognized previously and which are important to the complex polymer systems formed. Sensitive analytical techniques for the determination of isocyanate reaction products have been developed and are helpful in this connection.

H. E. Railsback, Phillips Petroleum Co., described a new vulcanizing system for butadiene-2-methyl-5-vinylpyridine rubbers which provides acceptable processing safety in factory mixing and permits vulcanizates with high load carrying capacity, good low-temperature properties, and excellent abrasion resistance. These rubbers are now available in semi-commercial quantities for general-purpose use and at specialty rubber prices.

Avery A. Morton, MIT, reported on further work with Alfin polymers of butadiene. He referred to a previous paper given before the Rubber Division in May, 1955, on the oil extension of such polymers. In this most recent paper the emphasis was on the relation of yield to age of the allylsodium and the ratios of allylsodium to the isopropoxide use in the polymerization. Also, it has been found that reworking the compounded Alfin polybutadiene improves the processing and physical properties greatly.

L. C. Bateman described the preparation and properties of graft and block polymers of natural rubber with synthetic polymers. Block polymers from solid natural rubber may be prepared, and this method is of wide general application both as regards base polymer and the reactivity of the monomer and its chemical and physical nature.

M. L. Dunham, silicones division, Union Carbide & Carbon Co., described the use of di-*tert*-alkyl peroxides as curing agents for silicone rubbers containing vinyl and cyclohexenyl groups as sources of unsaturation in the silicone rubber.

J. H. Lorenz, of the same company, described the properties and uses of this new vinyl containing silicone rubber. New compounds for thick sections with lower compression set, greater steam resistance, greater oil resistance, and with simplified curing schedules are now available.

Two papers on the effect of natural gas combustion fumes on the aging of latex foam rubber were presented; the first, by D. M. Holkestad of Firestone, and the second by H. L. Goebel, of U. S. Rubber. It is obvious that the nitrogen dioxide in the fumes is the cause of unusually rapid

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J. C. Bateman, BRPRA, discusses graft polymers

deterioration and discoloration of latex foam rubber, and there is a need of a new antioxidant to provide resistance to aging of this sort.

S. R. Shuart, Enjay Laboratories, reported on a most unusual effect of heat treatment of butyl rubber containing fine thermal carbon black and plasticizer in which the tensile strength is increased rather than decreased by the addition of the plasticizer.

M. L. Studebaker, Phillips Chemical, presented some interesting data on the correlation between the amount of carbon black surface and the oxygen content of the carbon black and the scorch properties of natural rubber stocks accelerated with mercaptobenzothiazole and benzothiazole sulfenamide.

A paper by C. H. Leigh-Dugmore, Dunlop Research Center of England, was presented by J. Carr, Dunlop Research Center of North America, and described a method of measuring carbon black dispersion in rubber by means of a light microscope. The method has been found suitable for control of factory mixed stocks.

I. Drogin, United Carbon Co., presented a detailed analysis of factors and results involved in short-cycle *versus* long-cycle mixing in the laboratory Banbury. It was suggested that longer mixing cycles may be desirable in some instances in order to lower viscosity and nerve and reduce shrinkage and swell, depending on the final end-use of the compound.

C. H. Lufter, Goodrich Chemical, provided information on the properties of a carboxylic nitrile rubber now commercially available from his company. Properties of carboxylic nitrile rubber significantly better than those for normal nitrile rubber are abrasion resistance, compression set, and hot elongation. Blends of the carboxylic nitrile rubber with polyvinyl chloride produce stocks which have improved processibility.

S. S. Kurtz, Jr., Sun Oil Co., described the composition of rubber processing oils and the use of the viscosity-gravity constant as a means of classifying such oils. Processibility, volatility, low-temperature properties, and degradation and oxidation effects were discussed in relation to the proposed classification.

The final paper on the program was given by C. L. Petze, Delaware Research & Development Corp. A new composition employing silicones and other rubbers and having novel properties for severe service applications in the electronics field was described.

Rubber Division 1919-1927

Arnold H. Smith, Division secretary, 1919-1927, gave his paper entitled, "The Rubber Division 1919-1927 as I Remember It," during the Thursday morning technical session.

Mr. Smith said the first meeting of rubber chemists associated with the ACS which he attended was held in Cleveland in September, 1918. It was at this meeting that it was decided to petition the Society for Division status, and the first meeting of the new Division was held in Philadelphia in September, 1919. At this Philadelphia meeting, an inspection trip through a rubber factory, Lee Tire & Rubber Co., was offered for the first time.

At the next meeting of the Division in April, 1920, in St. Louis, Mo., the need of cooperative research in the rubber industry was stressed, and the need of knowledge of composition as well as trade names of rubber compounding ingredients was occupying the attention of the members. The September, 1920, meeting in Chicago saw the start of a project for a Division publication which culminated in the first issue of *Rubber Chemistry and Technology* in 1928.

Reference was made to the April, 1923, meeting of the Division in New Haven, Conn., where a special dinner-meeting honoring Charles Goodyear, the discoverer of vulcanization who did his experimental work in that area, was held.

Mr. Smith mentioned that the oxygen bomb of Bierer and Davis was first described at the meeting in Washington, D. C., in April, 1924.

An attendance of 293 at the Akron meeting in 1926 attracted the attention of the parent Society, and comment on the growth of the Rubber Division appeared in the *Journal of Industrial and Engineering Chemistry* in March of that year.

In conclusion, Mr. Smith said that he felt that the Rubber Division, as he knew it, was the means by which rubber technologists came to know each other, to compare notes, to compete in research and technical accomplishments, and to apply in a practical manner the results of their work. He added that through the efforts of the Rubber Division, rubber technology is many years ahead of what it would otherwise be, and that the success of the synthetic rubber program of World War II was due in a very large degree to the contacts made previously between Rubber Division members.

The Rubber Division has done even more in making leaders out of chemists and thinkers out of the curious and, finally, has been a very great asset to our country, the former division secretary further declared.

Division Banquet

The Division banquet held on the evening of May 17 was featured by brief remarks by Chairman Juve and entertainment in the form of a variety program.

The Division chairman mentioned the Cleveland meeting registration of 1,300 and added that according to some estimates membership of the Division could reach 4,000 by 1965. Under present or future conditions the attendance at Division meetings may be getting too large and may detract from the value of such meetings to the members, he added. Attendance at future meetings and its relation to the conduct of these meetings are being considered by the executive committee.

The selection of S. M. Cadwell as the Division's 1956 Goodyear Medalist was again mentioned.

Officers and directors of the Division and the chairman of the local committee seated at the head table were introduced. Alden H. Emery, executive secretary of the Society and a guest of the Division at the head table, brought greetings from the Society officers and the 76,000 members of the Society to those present at the banquet.

Cadwell Goodyear Medalist

The selection of Sidney M. Cadwell, director of research and development for United States Rubber Co., as the Division's 1956 Goodyear Medalist was announced at the Cleveland meeting, as mentioned previously.

The Charles Goodyear Medal[1] in commemoration of the discoverer of the vulcanization of rubber is awarded annually to the person who has made a valuable contribution or contributions to the science or technology of rubber or related subjects.

Dr. Cadwell was cited for his "pioneering research in the field of rubber accelerators and antioxidants," and his work during the 1920's produced the thiuram monosulfide ultra-accelerators and the first commercial antioxidant for rubber, an aniline-acetaldehyde reaction product. At about the same time he was issued a series of patents, of which the Medalist holds 69 in the rubber field, dealing with means of achieving rapid vulcanization by use of varying combinations of four ingredients: namely, sulfur, zinc, an amine, and carbon disulfide. The carbon disulfide may be introduced as xanthate; zinc as zinc oxide; an amine as dibenzylamine, and sulfur as sulfur; or carbon disulfide and an amine may be introduced together as a dithiocarbamate.

[1] See our Jan., 1956, issue, p. 533.

Pach Bros., N. Y.

S. M. Cadwell, U. S. Rubber Co., 1956 Goodyear Medalist

From 1930 to 1945, Dr. Cadwell served as director of tire development for U. S. Rubber and made notable contributions to improving tire quality and service life. During World War II, he was credited with the development of a lightweight, cool-running, synthetic rubber, cotton-cord military truck tire that became standard for the duration of the war. He also pioneered the use of nylon cord in airplane tires during the war period and personally directed the building of the first bullet-sealing fuel cell for military aircraft.

Dr. Cadwell received his bachelor's and doctor's degrees from the University of Chicago and joined U. S. Rubber as a research chemist in 1919, after serving as a captain in the Chemical Warfare Service during World War I. The Medalist is a member of numerous scientific and professional societies in addition to the ACS, including the AAAS, AIChE, APS, Society for the Chemical Industry, etc. He is a fellow of the Chemical Society of London. He is also a past chairman of the Rubber Division.

Six at Northeast Section in Short Talks Symposium

The Fifth Annual Short Talks Symposium of the Elastomer & Plastics Group, Northeastern Section, ACS, was held at the Continental Hotel, Cambridge, Mass., May 15, and consisted of six brief papers on a variety of topics. Peter R. McClure, Godfrey L. Cabot Labtoratories, was symposium chairman. Eighty members and guests attended.

Speakers and their subjects were as follows: Dexter P. Huntington, Linde Air Products Co., "Silicone-Organic Copolymer Systems"; Robert N. Bonnett, Bonny Mfg. Corp., "Properties and Applications of Teflon Tape"; K. P. Seltzer, Cabot, "High-Conductivity Carbon Black in Elastomers"; Robert H. Haberstroh, American Steel & Wire Division of United States Steel Corp., "Recent Developments in Rubber Insulated Cables" (co-authored by W. G. Dahlstrom); and Derek Till, A. D. Little, Inc., and Ralph Winters, American Viscose Corp., "Fibrous Rubber—Its Production and Potential Uses."

Mr. Huntington outlined the chemistry and application of alkoxypolysiloxanes as linking agents in the preparation of modified silicones useful where the oxygen, heat, weather, and electrical properties of silicones were wanted in combination with the good physical, mechanical, adhesive, and cost properties of the organic elastomers.

Mr. Bonnett heated a sheet of Teflon at 645° F. The sheet sintered instantaneously, shrank transversely, became transparent, increased in specific gravity from 1.5 to 2.6, and increased 10 times in tensile strength. He pointed out that sintering involves no flow, no cross-linking, no molecular weight change; while higher temperatures merely produce pyrolysis. Du Pont's recently announced Teflon 100X may solve some of the processing problems, Mr. Bonnett concluded.

Mr. Seltzer revealed that Cabot's new XC-72 possesses more structure than other blacks, has higher porosity and finer particle size, and a higher degree of conductivity with better tensile properties than acetylene black. The ability of the compounded black to retain its high conductivity, when the cured stock is flexed, was said to be of outstanding value in belting. Overworking in processing was shown to have but slight effect on this property of the black.

Mr. Haberstroh stressed the value of jacketing cables with neoprene to prevent ozone cracking. He described the blending of elastomers to improve ozone resistance, mentioning nitrile rubber combinations with "Hypalon," and vinyl resin and silicone rubber in a variety of ratios. He concluded with an appraisal of oil-base compounds containing factice, butyl rubber, and neoprene fortified with antiozonants, as well as polyethylene, vinyl compounds, and "Hypalon." "Hypalon" had outstanding corona resistance, he said.

Mr. Till described how fibrous rubber was produced from solutions by pumping into a high-velocity air stream, drying in a heated secondary air stream, then impinging on a surface and forming a mat that could be withdrawn, vulcanized in hot air after pressuring for gage control, and cooled.

Mr. Winters described the rubber as porous and fibrous, having a random structure, a high tensile strength, and a low density. The low bulk density of the fibrous rubber, its fast recovery, high permeability, structural stability, and ability to be made into thin sheets, he said, gave it excellent possibilities in cushioning, belting, filters, and rug underlays.

Rubber Literature Meeting

The Chemical Literature and Rubber Chemistry divisions of the American Chemical Society will conduct a joint symposium on "The Literature of Rubber" at the one hundred thirtieth meeting of the ACS, September 16-21, at Atlantic City, N. J. Offers of papers, preferably with a 200-word abstract, should be sent to the symposium's chairman, Miss Hanna Friedenstein, Godfrey L. Cabot, Inc., Research and Development Department, 38 Memorial Drive, Cambridge 42, Mass.

Tlargi Hears "Hypalon" Talk by Du Pont's Lawrence

"'Hypalon' Synthetic Rubber" was the title of a paper presented by H. Logan Lawrence, neoprene and "Hypalon" sales manager for E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., before 80 members and guests of The Los Angeles Rubber Group, Inc., at the Hotel Statler, Los Angeles, Calif., May 1.

Mr. Lawrence pointed out that there was one important difference between "Hypalon" and other kinds of synthetic rubber—the method of manufacture. With "Hypalon" the key step is the transformation of a preformed high molecular weight thermoplastic, polyethylene, into a vulcanizable elastomer through chemical reaction with chlorine and sulfur dioxide. With the other commercially important synthetic rubbers there is involved the polymerization of one or more monomers as the key step in the production of the final product.

After considering the chemistry of manufacture, mechanism of vulcanization, and basic curing formulations for "Hypalon," the du Pont sales manager discussed another difference between the rubber and other elastomers: processing. Natural rubber and many of the important synthetic rubbers must be broken down by milling in order to make them plastic enough to work on rubber processing equipment, he said.

"Hypalon," on the other hand, requires no breakdown period in order to obtain material which is satisfactory in viscosity and smoothness when banded on a rubber mill. Mr. Lawrence declared that a clear realization of the thermoplastic nature of unvulcanized "Hypalon" is essential to satisfactory processing and factory handling.

Again unlike other stocks, "Hypalon" usually requires no reinforcing fillers such as carbon black to achieve useful combinations of properties, Mr. Lawrence explained. Therefore, he added, outstanding abrasion resistance, flex life, and weather resistance can be obtained in "Hypalon" stocks having a variety of colors without sacrifice of other properties.

Details on mill mixing and Banbury mixing of "Hypalon" were then given, as well as advice on finer calendering of the rubber, typical recipes for friction and skim coat stocks, and tips on extruding of "Hypalon," compression molding, and curing in dry air.

It was said that the more outstanding properties of "Hypalon" vulcanizates are related to its stability and durability under such conditions as elevated temperatures, abrasion, flexing, ozone resistance, and resistance to weathering. In general, "Hypalon" 20 vulcanizates are stiffer than those of natural rubber, being higher in modulus and lower in elongation. Tensile strength values as high as 3,500 psi. are readily obtainable. Other property values were listed.

"Hypalon" vulcanizates were considered to be essentially inert to attack by ozone since no "Hypalon" compound has ever been observed to crack under a wide variety of exposure conditions. It was said that the rubber performs better in outdoor weathering tests than any other elastomer.

Mr. Lawrence concluded his talk with a discussion of "Hypalon" paints and solution coatings, which he believed to be almost limitless in use.

The May 1 Tlargi dinner-meeting was dubbed "Ohio Rubber Co. Night." Ten door prizes contributed by that company were distributed to the group's members. L. E. Budnick, of Ohio Rubber, acted as master of ceremonies. Guest speaker was Lloyd V. Prante, principal of John Adams Junior High School in Los Angeles, who spoke on "Eat Your Apple Now."

Tire Chemicals Statistics Discussed by Vila at ACS

George R. Vila, assistant general manager of Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn., delivered a talk on "Tires—An Expanding Market for Chemicals," before the American Chemical Society's Division of Chemical Marketing and Economics at Dallas, Tex., April 10.

In 1955 the tire industry consumed the staggering total of 4,224,000,000 pounds of chemicals, of which 1,169,000,000 pounds were used directly in tire rubber compounding, 1,327,000,000 pounds in the manufacture of synthetic rubber for tires, and 1,728,000,000 pounds in producing rayon and nylon tire cord fabrics.

Breaking down the 1,169,000,000 pounds of chemicals used in tire rubber compounding, Mr. Vila revealed the following figures (in millions of pounds): carbon black, 826; zinc oxide, 104; fillers and pigments, 84; sulfur, 56; fatty acids, 47; accelerators, 18; antioxidants, 16; processing oil, 11; and special chemicals, 7.

Mr. Vila concluded his address with the following predictions: by 1980 the quantity of chemicals consumed by the tire industry will be 50-100% greater than in 1955; car registrations by 1980 will reach 85 million from the 50-million registration in 1955; in the same period the average service life of tires will have risen from 35,000 miles to 50,000 miles; and the ratio of synthetic rubber used in tires will have increased from 59 to 85%.

SBR Talk by RW's Seaman At Ontario, Buffalo Meet

Robert G. Seaman, editor of RUBBER WORLD, was guest speaker at the annual international rubber meeting of the Ontario Rubber Section, CIC, and the Buffalo Rubber Group, ACS, at the Sheraton-Brock Hotel, Niagara Falls, Ont., Canada, May 11. His subject was "GR-S Type Synthetic Rubber—Present and Possible Future Trends."[1] More than 300 members and guests of the two organizations were present.

Presiding over the meeting was Charles W. Wahl, chairman of the Buffalo Rubber Group. Other guests at the head table during dinner were Charles Miserentino, vice chairman, Buffalo Group; John Helwic, secretary-treasurer, Buffalo Group; B. S. Garvey, Jr., vice chairman, Division of Rubber Chemistry, ACS; George Popp, treasurer, Division of Rubber Chemistry; W. H. Bechtel, chairman, Ontario Section.

Also G. Grushcow, vice chairman, Ontario Section; Wray Cline, secretary, Ontario Section; Carl Croakman, treasurer, Ontario Section; Garnet T. Page, general manager, Chemical Institute of Canada; Gordon Baxter, chairman, Rubber Division, CIC; and E. R. Rowzee, immediate past president, CIC.

A suppliers' cocktail party, convened by Des Seymour of the Ontario Section, preceded the dinner.

[1] Published in full on pp. 399-414

Northeastern Epoxy Talk

Farris S. Swackhamer, Shell Chemical Corp., spoke on "Epoxy Resins" before 90 members and guests of the Elastomer & Plastics Group, Northeastern Section, ACS, at the Continental Hotel, Cambridge, Mass., April 17.

Illustrating his talk with slides giving comparisons of numerous epoxy resins with other plastics, solid, reinforced, and in the fluid state, Mr. Swackhamer discussed the chemistry and technology of epoxy formation and the various types secured with the many amines, acids, and other resins available for cross-linking or hardening of the product.

He then gave a demonstration of an amine cure by mixing a batch in a tin frying pan and frying an egg with the heat evolved. This was followed by an illustration of the alkali-proofness of thin metal-foil laminates. Here suspended samples were treated with caustic soda, thus destroying the aluminum foil portions and leaving the epoxy film underneath intact.

Finally, other applications of epoxys as castings, adhesives, potting compound for intricate electrical systems, for laminating, and as molds or molding dies were demonstrated.

Testing Talk at Berkeley

Anthony Black, manager of the West Coast material quality department of the San Jose, Calif., assembly plant of Ford Motor Co., addressed 60 members and guests of the Northern California Rubber Group at the Berkeley Elks Club, Berkeley, Calif., May 10, on "Procurement Testing in the Automotive Industry."

Mr. Black summarized the test procedures involved in purchasing materials at the San Jose plant. The company's laboratory contains typical rubber testing equipment, as well as a weatherometer for simulating aging, an ozone box for accelerated aging, equipment for testing automotive finishes, and salt-spray test facilities.

There is also a complete metallurgical laboratory for photo-micrograph work and crystalography studies. This laboratory also carries out simulated end-use tests such as spring flex tests, fatigue, torsional, and high-frequency vibration evaluation.

A motion picture on highway planning and safety concluded the evening's activities.

NEWS of the MONTH

Washington Report and National News Summary

. . . President Eisenhower's report to Congress of April 30 on rubber emphasized that the government received full, fair value from the sale of the synthetic rubber plants; the consuming public and large and small rubber goods fabricators had received the benefits of fair competition between private producers of synthetic rubber; and the synthetic rubber facilities had been sold under terms insuring ready availability in time of emergency.

. . . Attorney General Brownell's report to the Senate Banking & Currency Committee of May 1 affirmed, in addition, that there was adequate evidence of competition in the synthetic rubber industry and that no single producer of styrene-butadiene rubber had achieved undue market influence. It was suggested, however, that greater product diversification by individual producers and more price flexibility would accelerate future growth of the industry.

. . . Later in May the Attorney General opposed the sale of the alcohol-butadiene plant at Louisville, Ky., to Union Carbide & Carbon Corp. on the grounds that it would be converted to making other chemicals.

. . . A joint survey by the Commerce Department and the Securities & Exchange Commission predicts capital outlays for new plant and equipment by the rubber industry will amount to $176 million in 1956, an increase of 17% over such outlays in the preceding year.

. . . Commerce also reported on exports of synthetic rubber from the United States, which reached a figure of 93,289 long tons in 1955 and are now large enough to become a reckoning factor in balancing world supply and demand for rubber.

. . . The Rubber Manufacturers Association and the National Tire Dealers & Retreaders Association have urged Congress to eliminate or at least modify the plan to tax all tires and tread stocks on hand in stores and warehouses on July 1, in view of the financial burden to the tire dealer.

. . . The United Rubber Workers of America, AFL-CIO, has asked the Big Four rubber companies for new wage talks this summer.

Washington Report

Eisenhower's, Brownell's Rubber Reports Optimistic; Ample Rubber Supplies Due to Synthetic's Growth

The Eisenhower Administration was right on schedule last month with its two anxiously awaited reports to Congress on the long- and short-range effects of the synthetic rubber transfer to private industry. Congress, however, greeted these reports with a silence generally laid to election-year preoccupation with a number of pieces of major legislation, but, more specifically, to the fact that neither report was particularly controversial.

For example, in sending up to Capitol Hill the report required by the Rubber Producing Facilities Disposal Act, President Eisenhower recalled the three original objectives of the act and said they had been met "to a highly satisfactory degree." At the same time, Attorney General Herbert Brownell reported, on the basis of the first eight months of almost complete private production of synthetic, that he could find no concrete evidence that the program had been mishandled from the standpoint of monopoly.

The Justice Department report was sent to the Hill in accordance with a long-standing request of the Senate Banking Committee. During hearings on the disposal program last year some members of the committee expressed concern that the bulk of the government's rubber-producing facilities was being sold to the largest rubber and oil companies with "not unblemished" anti-trust records. This concern grew, subsequently, into an actual mandate:

"In order that there be no doubt in this regard [that the Department of Justice would maintain its vigilance in enforcing the anti-trust laws], however, the committee requests the Department of Justice to report to the Congress each year for the first 10 years following sale of the facilities."

Brownell Report

Following the transfer of all but two synthetic plants, the Department decided to submit its first report this spring, despite the fact that it would cover less than a full year. Its principal objectives were to determine whether (a) competition existed in the synthetic rubber industry during the first eight months of private ownership, and (b) small businesses received a fair share of synthetic rubber at fair prices as contemplated by the Disposal Act and

the contracts covering the sales of the plants.

Justice then launched a comprehensive investigation of (a) all producers of synthetic rubber and its component ingredients, except the recent purchaser of the Institute, W. Va., copolymer plant—Goodrich-Gulf Chemicals, Inc.—and (b) a representative sample of rubber fabricators "whose size, when measured by volume of sales or number of employes, would appear to place them in the category of small-business enterprises in the rubber industry."

On the strength of this probe, Attorney General Brownell reported affirmatively on both counts—competition in the industry and compliance with the small-business provisions of both the act and the sale contracts [a considerable portion of the text of his findings is carried in the lead article of this issue].

President's Report

Meanwhile, Office of Defense Mobilization Chief Arthur S. Flemming had rounded up a seven-man ad hoc committee—representing several agencies—to report to Congress on the nation's rubber requirements and sources effective with the disposal of the bulk of the producing facilities and on "the need, if any, for further research by the government relative to the production or use of synthetic rubber and its component materials."

Named to the committee by Dr. Flemming were: Arthur Wolf, ODM chairman; Everett G. Holt, Department of Commerce; Frederick D. Bates, Jr., Department of Defense; Carroll D. Fentress, Department of the Interior; G. J. Irwin, Treasury Department; William G. Colman, National Science Foundation; and Harold W. Sheehan, Rubber Producing Facilities Disposal Commission. Four others took an active part in preparation of the report: Thomas R. Baldwin and Horace B. Drury, ODM; Willis C. Armstrong, Department of State; and James M. Wainger, Rubber Producing Facilities Disposal Commission.

On the basis of this group's 38-page report, President Eisenhower was able to conclude that (1) the government had received full fair value for 26 plants sold to private interests; (2) the general public, as well as the large and small rubber fabricators, had received the benefits of fair competition; and (3) the facilities put on the block will be available for synthetic production in time of emergency.

"As respects the first point," the President advised Congress, "the synthetic rubber facilities were built during World War II at a cost of approximately $700,000,000. After plant operations over the years and disposal of some of the facilities in the 1946-1950 period had recovered more than half of this investment, the recent disposal of 26 plants for $285,000,000 has resulted in the recovery of the entire remaining investment, and beyond this, yielded to the United States Treasury an additional $22,500,000. This does not include such additional returns as may come from the sale or lease of the alcohol butadiene plant at Louisville, Ky., and disposal of the Government Laboratories at Akron, Ohio. Plant disposal, signaling the end of government production and marketing of synthetic rubber, has also freed approximately $162,000,000 of working capital formerly committed to plant operations.

"From the all-important security angle, not only have all sales been made with a national security clause which guarantees availability for rubber production in time of emergency, but the plants, in general, are now operating intensively and already have effected marked increases in capacity. Synthetic rubber has become a highly viable private industry; facilities are being expanded and technical advances and progress toward the development of new rubbers are being made."

The President put his finger on a highlight of the report in reassuring natural rubber interests of a continued domestic demand for their production, even in the face of synthetic expansion expected to reach 1.7 million tons of capacity annually two years before the total demand for new rubber reaches that figure—1960.

"In view of the ever-expanding needs of rubber consumers," he observed, "the synthetic rubber industry is bound to continue rapid growth in the immediate future; because new synthetic capacity can be created in one-third the time required to bring rubber trees to maturity, and some of the demand for additional rubber will come too early to be met by expansion of natural rubber production. In the long run, however, the greatly improved techniques now available for natural rubber production should make it possible for producers of natural rubber to share in supplying the ever-growing rubber demand."

NRB on Prices

While President Eisenhower failed to mention the all-important price factor in the synthetic-*versus*-natural competitive picture, submission of the special report to Congress was followed by a warning of the Natural Rubber Bureau to its members that price would become increasingly important within the next 18 to 24 months. By the Spring of 1958, the Bureau predicted, "there is pretty certain to develop a sizable increase in the total over-all supply of new rubber and an easing of the tight supply-demand picture.

"When this happens—for the first time since the end of World War II—we will have a situation unaffected by government controls, government production or a tight supply situation on total new rubber."

The Bureau estimated that natural could continue to hold at least 35% of the domestic market at the existing 5-6¢ price spread. If, as predicted, however, the spread should narrow to at or near parity, "natural should begin to recapture a sizable portion" of the market open to either natural or synthetic (also estimated at 35%), the Bureau declared.

"The quality-price criteria in the future, however," NRB added, "will have several new factors added on the synthetic side which were not present under government operation. Efficient distribution and technical servicing elements are already on the scene. Also the owners of captive plants will obviously have to weigh the disadvantages and actual costs involved in switching from their own manufactured material to natural.

"Nevertheless, total consumption over the long pull is substantially growing. Experts see a 3,200,000-3,400,000-ton world market by 1960 and with this sort of demand both rubbers are here to stay profitably and on a reasonably stable price basis."

Export Demand and Research

With foreign demand expected to eat up half of the 1960 estimate of 3,400,000 tons, the special committee appointed by Dr. Flemming found itself occupied not with the question considered by the Natural Rubber Bureau, i. e., whether there would be enough of a demand, but, rather, whether there would be enough natural rubber to meet this demand.

"If foreign countries do not consume substantially more synthetic than at present," the committee warned, "there will not be enough natural rubber to meet both the rapidly expanding new rubber requirements of foreign countries and U. S. requirements for natural rubber.

"Economic necessity and the organization of the rubber industry appear to make a substantial foreign shift to synthetic rubber a practical certainty."

In thus forecasting a growing foreign market for synthetic—the bulk of which will come from American producers—the committee put its finger on the major outlet for the substantial synthetic excess expected to develop here in the next few years. To permit the U. S. to import enough natural to supply 40% of the total new rubber need, the committee said, foreign rubber consumers would have to increase synthetic purchases by about 100,000 tons annually to 600,000 tons a year by 1960. The group indicated doubt that much of this would come from plants in the United States, at least for the next few years.

In another important area of its investigation — research — the committee recommended to President Eisenhower that he approve the several-month-old recommendations of the National Science Foundation's special commission for rubber research. In following this advice, the President made these recommendations to Congress:

1. The present program of government-sponsored rubber research projects, costing about $1 million per annum and temporarily administered by NSF, should be regarded as terminated at the end of June.

2. In place of this program, NSF should support a new and more basic program made up of research projects in the general area of molecular structure and arrangement, composition, and properties of high polymers, particularly elastomers and methods of preparing such materials.

Under this plan the government will withdraw its support of rubber research conducted by universities and other research organizations and will put up for sale the Akron laboratories, engaged for years in developing the production characteristics and feasibility of new types of rubber.

The President also reminded Congress that NSF's special commission went beyond the subject of research to urge that immediate consideration be given—at the

highest government levels—to whether the national security requires governmental action to foster the industrial development of new processes for synthesizing "natural" rubber.

"Inasmuch as the United States already has an adequate stockpile of natural rubber," the President suggested, "there is . . . no immediate security problem. In the long run, however, maintenance of security would be vastly simplified if we could—if need be—produce types of rubber domestically which could take the place of natural rubber in large truck, bus and airplane tires. The newly synthesized rubbers hold this promise.

"It is believed that we can rely upon the private synthetic rubber industry to move from laboratory synthesis to commercial production of synthetic 'natural' rubber. Pilot plants are already being constructed on private initiative. The nature of the problems which may arise when quantity production is contemplated is as yet undefined.

"The government has available a number of means for assisting industrial development and expansion where such aid is found to be essential to national security. It is not now expected that any unique measures, such as would require new legislation, will need to be taken with reference to the development of capacity to produce synthetic 'natural' rubber."

Attorney General Opposes Union Carbide Plant Sale; Publicker Raises Bid and Criticizes Commission

Attorney General Brownell's reluctance to clear the sale of the alcohol-butadiene plant at Louisville, Ky. to Union Carbide & Carbon Corp. in May was based primarily on the fear that the facility would be converted from alcohol-butadiene production to the production of any one of a number of other chemicals. In this respect the Attorney General could not make a finding required by the Rubber Producing Facilities Disposal Act of 1953 that the sale to Carbide "would foster the development of a free, competitive synthetic rubber industry."

Conversion from butadiene production, the Justice Department feared, might "tend to bring about the elimination of" the nation's only alcohol-butadiene producer, Publicker Industries, Inc., whose purchase bid on the Louisville plant was turned down. Justice said the sale to Union Carbide would not violate the anti-trust laws, but the Department could not give the same clearance on the "fostering a competitive industry" aspects of the sale.

Union Carbide, a surprise bidder, went as high as $3.125 million in the negotiations following submission of its original bid; Publicker, on the other hand, cut off its bidding at $2.4 million, only to come back after the announcement of sale to Union Carbide to match the amount offered by the successful bidder. A Publicker spokesman called this a proper move on the part of this company because the bidding period still had three days to run. Publicker's position was explained this way:

"The Rubber Producing Facilities Disposal Commission's choice lay between selling to Union Carbide for $3.125 million, if that sale could be approved by the Attorney General, or selling to Publicker for the identical figure in the event the Attorney General forbade the sale to Carbide and approved the sale to us. This alternative was before the Commission, but the Commission declined to place the same alternative before the Attorney General."

Currently operating the Louisville facility at one-third capacity under a three-year lease from the government, expiring April 4, 1958, Publicker has two alcohol plants in Louisiana and one in Philadelphia, alcohol production capacity it describes as adequate to operate the Louisville alcohol-butadiene plant at a capacity equivalent for the production of enough butadiene to make 100,000 long tons of styrene-butadiene rubber annually.

Lawrence R. Brown, in charge of butadiene operations for Publicker and assistant to the president, fired a sharp blast at the Commission for the way it handled the sale, when he said:

"In our view, the Commission's so-called report to Congress has not validity because it does not contain what is required by law, namely, the finding of the Attorney General approving the proposed disposal. Because of the Attorney General's disapproval, no sale, we believe, can be made to Carbide and nothing that can properly be considered a report can be filed under the Act."

Commerce Dept. Survey Indicates 1956 New Plant and Equipment Expenditures To Rise 17% over 1955

The Commerce Department's publication, "Chemical and Rubber Industry Report," for April includes the results of a survey made by that Department and the Securities & Exchange Commission with regard to past, present, and future expenditures for new plant and equipment by all manufacturing industries, the chemical and allied products industry, and the rubber products industry.

The chemical industry estimated that it would spend $1,426 million in 1956, an increase of 40% over the 1955 level and just about equal to the 1953 all-time peak. In comparison, outlays for all manufacturing industries combined showed an expected increase of 31% for 1956. The rubber products industry is expected to spend $176 million in 1956, which represents an expenditure some 17% above the $150 million spent last year and 9% more than the previous record of $161 million reached in 1953.

Chemical producers estimate an expenditure of $650 million on capital equipment for the first half of 1956, which is 17% greater than that in the previous half-year period and 41% higher than outlays in the comparable first half of 1955. Apparently, the chemical industry expects to increase its capital goods spending in the last half of 1956 some 19% above the first half, as compared with a 10% advance for all manufacturing industries combined.

In the rubber products industry, capital outlays in the last quarter of 1955 totaled $45 million, and a continuation at about this level is expected through the first half of 1956. A slight decline to $86 million is foreseen for the second half of the year.

The accompanying table taken from the Commerce Department publication shows the new plant and equipment expenditures for all manufacturing, chemical products, and rubber products for the period 1945-56.

U. S. EXPENDITURES* ON NEW PLANT AND EQUIPMENT FOR ALL MANUFACTURING, CHEMICAL AND ALLIED PRODUCTS, AND RUBBER PRODUCTS, 1945-56

(Millions of Dollars)

Year	All Manufacturing	Chemical and Allied Products	Rubber Products
1945	3,983	376	118
1946	6,790	800	139
1947	8,703	1,060	143
1948	9,134	941	102
1949	7,149	670	81
1950	7,491	771	102
1951	10,852	1,247	150
1952	11,632	1,386	154
1953	11,908	1,428	161
1st quarter	2,668	325	35
2nd quarter	3,098	381	44
3rd quarter	2,858	344	38
4th quarter	3,284	378	44
1954	11,038	1,130	131
1st quarter	2,569	309	32
2nd quarter	2,859	292	35
3rd quarter	2,645	252	29
4th quarter	2,965	277	35
1955	11,439	1,016	150
1st quarter	2,249	231	30
2nd quarter	2,794	230	36
3rd quarter	2,898	239	39
4th quarter	3,498	316	45
1956†	15,036	1,426	176
1st quarter†	3,340	310	44
2nd quarter†	3,808	340	46

* Data exclude expenditures of agricultural business and outlays charged to current account.

† Represent estimates based on anticipated capital expenditures as reported by business from late January to early March, 1956.

NOTE: These data represent all capital outlays by companies classified in the chemical and rubber products fields as distinct from Bureau of the Census reports which allocate such outlays by establishment or plant to specific industries.

SOURCE: Based on business reports to the U. S. Department of Commerce and the Securities & Exchange Commission.

The extensive advances in planned expenditures for new plant and equipment appear to stem from several factors, Commerce said. Principally involved is the confidence of businessmen generally in both maintenance of sales at a high level and continuance of growth in the rate of potential demand. The fact that scheduled outlays of chemical producers are well over a fourth greater than those of the all-manufacturing groups indicates the ex-

tent to which an enlarged and widening industrial demand for chemical products is anticipated. Supporting the thesis of continued growth is the responsible factor brought out by the survey that current planning makes provision for a sharper rise in outlays for the expansion of productive facilities as distinguished from those for replacement and modernization, it was added.

The rubber industry historically has had to cope with sudden surges of demand for its manufactured products. The record new rubber consumption in 1955 was a severe test of the ability of synthetic rubber producers to provide required materials. The very high demand for rubber products, however, was met without undue strain.

The scheduled capital equipment expenditures for 1956 indicate that the rubber industry is continuing its policy of preparedness, the Commerce Department report concluded.

United States Exports of Synthetic Rubber

The "Chemical and Rubber Industry Report" publication of the Commerce Department for April, 1956, also contains some interesting information and statistics on exports of styrene-butadiene (SBR), butyl, neoprene, and nitrile rubbers for the year 1955.

It was said at the outset that for the first time in a period of world peace, United States exports of synthetic rubber were large enough in 1955 to become a reckoning factor in balancing world supply and demand for rubber.

U. S. exports of synthetic rubber rose from only 30,117 long tons in 1954 to 93,289 long tons in 1955. Considering the need of continued use by the United States industry of 40% natural rubber, as based on past operations, a further reduction of this percentage of the total new rubber by use of increased quantities of present types of synthetic rubbers is not considered likely.

But in foreign free-world countries, where synthetic rubbers in 1955 accounted for only 11% of the new rubber consumed, as compared with almost 59% in the United States, there is vast opportunity for increased use of synthetics. Increased usage abroad could be of the order of 100,000 tons annually for several years, especially since synthetic plants planned for England, France, and Western Germany will not come into production until 1957, it was added.

In 1955, United States exports of synthetic rubber exceeded 10,000 tons to only two countries and exceeded 5,000 tons o four other countries (see the accompanying table). The tremendous increase in these exports since the American producing industry has been privately owned reflects a prompt reaction to the international rubber situation, Commerce concluded.

UNITED STATES EXPORTS OF SYNTHETIC RUBBER BY TYPE AND DESTINATION, 1955

(Long Tons)

Destination	S-Type	Butyl	Neoprene	N-Type
Canada	6,527	265	2,678	277
Mexico	4,670	—	170	20
Cuba	326	10	4	—
Colombia	737	140	24	11
Venezuela	2,088	44	26	7
Chile	501	7	86	5
Brazil	171	3	85	51
Uruguay	18	—	2	5
Argentina	505	409	256	121
Sweden	1,615	77	309	203
Norway	94	—	31	32
Denmark	109	—	26	15
United Kingdom	8,526	1,839	4,147	873
Eire	337	80	4	—
Netherlands	706	110	466	78
Belgium and Luxembourg	1,876	70	1,489	128
France	4,938	2,098	2,436	461
West Germany	6,587	2,775	2,920	975
Austria	285	295	69	49
Switzerland	877	246	263	57
Finland	—	—	61	21
Spain	590	—	91	11
Portugal	106	50	13	4
Italy	4,547	864	860	419
Greece	1	—	5	17
Israel	663	45	10	—
India	728	—	23	32
The Philippines	30	—	19	—
Japan	1,991	110	852	484
Australia	4,041	334	291	109
New Zealand	477	1	13	21
French Morocco	—	—	15	4
Egypt	46	11	—	4
Union of South Africa	5,879	7	265	37
Other countries	13	—	17	12
Miscellaneous*	98	5	72	50
Total: 1955	†60,703	9,895	18,098	4,593
1954	11,069	2,831	12,062	4,155

* Destination undesignated.
† Includes reexports of 59 tons.
SOURCE: Bureau of the Census.

RMA Joins NTDRA against Tire and Retread Stock Floor Tax in Federal Highway Use Bill

Washington spokesmen for the two rubber industry factions most interested in the new system of interstate highways—the tire manufacturers and the tire dealers and retreaders—joined forces last month to sell Congress on the idea of dropping an unsavory tax provision out of the highway bill.

Ross R. Ormsby, president of The Rubber Manufacturers Association, Inc., and Winston W. Marsh, secretary-general manager of the National Tire Dealers & Retreaders Association, asked the Senate Finance Committee to kill the plan for taxing all tires and tread rubber stocks on hand in the nation's stores and warehouses July 1. Both, however, sensing that Congress was not in a mood to cooperate, tacked a more palatable request to their plea—postponement of floor tax collection for two to six months. Mr. Marsh put it this way:

NTDRA Opposition

"We feel that this floor tax on new tires and tread rubber is a tremendous burden for the tire dealer to bear and since it is estimated that less than one-half of one percent of the total revenue dedicated to the highway fund will be derived from this floor tax, we ask that it be eliminated.

"If Congress, in its judgement feels that the floor tax on new tires is needed to help finance this highway program, then we believe that Congress should at least eliminate the floor tax on tread rubber. If the floor tax on new tires and tread rubber as passed by the House remains in the bill, then dealers should be given six months to pay for it as a means for relieving their additional capital investment requirements."

RMA Statement

Taking a slightly different tack, Mr. Ormsby withheld his proposal until he had presented documentary evidence that present estimates of revenue to be produced by the highway bill were too low, that the bill would raise up to $26 billion more than the $38 billion estimated by Congressional fiscal experts. With this backdrop he made this pitch for elimination of floor taxes:

"Considering the thousands of tire dealers and retreaders throughout the country who own inventories of tires and tread rubber, the imposition of floor stock taxes will create severe financial hardships in many cases, although the total revenue collected by this means is estimated to be only 0.3% of the total rubber taxes dedicated to the highway trust fund. . . . Since it appears the total estimated revenues are very conservative, it is suggested that the floor stock taxes on tires and tread rubber might be eliminated without affecting the total program.

"If the floor stock taxes are retained, then provision should be made to defer their payment for at least 90 days after the due date. . . . This deferred payment is essential to minimize the financial burden for thousands of tire dealers and to prevent a dangerous reduction in tire inventories in the midst of the heavy selling season."

Mr. Ormsby gave the Finance Committee some very interesting figures on past and future rate of growth in the use of automotive products. After noting that the $38 billion figure used by Congress was based on an expected growth rate of 3% compounded annually through 1972, Mr. Ormsby called this a reasonable estimate for the total economy, but said "it falls far short of the actual past experience in the automotive field."

Between 1947 and 1955, he testified, the Federal Government's tax collections on automotive items increased by more than 10% a year. Applying a 10% factor over the life of the highway bill (1957-1972), he said, would push the Congressional estimate to $64 billion.

"Therefore, if past growth is any criterion," Mr. Ormsby declared, "the difference between the (Congressional) revenue estimates and what is a possibility if we continue our rate of growth—or the difference of $26 billion—is a good cushion against any estimate that this program is not on a 'pay-as-you-go' basis."

The RMA official also cautioned the Administration to proceed uniformly with

construction of the interstate system so as to complete the job on the same schedule throughout the country.

"We in the rubber manufacturing industry strongly favor this program for national highway construction," he explained, "because it will bring this great project to reality on a practical basis, with fairness to all who use the roads and without imposing unjust burdens upon any group, including the 300,000 tire dealers and retreaders of this country."

Industry-Government Exhibit Research by Commerce

Nineteeen chemical and rubber companies took over the lobby of the Commerce Department last month for a little joint industry-government public relations. They teamed up with the United States Patent Office (1) to show the hundreds of businessmen visiting the Commerce Department every month what intensive research in chemistry and synthetics has produced, and (2) to point up the "stimulation and encouragement" to technological advancement afforded by the American Patent System.

The spectacular exhibit featured an animated presentation of the conversion of basic chemicals into well-known consumer products; a demonstration of the effectiveness of fire resistant materials; step-by-step production of common products from their early crude forms to current streamlined models; and a demonstration of synthetic fiber development from raw materials.

Occupying the stage were: Abbott Laboratories; Allied Chemical & Dye Corp.; Armour & Co.; Armstrong Cork Co.; Ciba Pharmaceutical Products, Inc.; Colgate-Palmolive Co.; Dayton Rubber Co.; Diamond Alkali Co.; Dow Chemical Co.; Dow Corning Corp.; E. I. du Pont de Nemours & Co., Inc.; P. R. Mallory Co.; Owens-Corning Fiberglas Corp.; Parke, Davis & Co.; Permacel Tape Corp.; Schering Corp.; Shell Oil Corp.; Thiokol Chemical Corp.; and Union Carbide & Carbon Corp.

The show's sponsor, the U. S. Patent Office, lined up a "star" to open the exhibit —Secretary of Commerce Sinclair Weeks —and followed him with the General Motors production, "Previews of Progress," a 35-minute "visit" to the chemist's laboratory.

URWA Asks Wage Increase for Big Four Members

The United Rubber, Cork, Linoleum & Plastic Workers of America, AFL-CIO, or briefly the URWA, announced on May 22 that it had sent 60-day wage reopener notifications to The B. F. Goodrich Co., Goodyear Tire & Rubber Co., Firestone Tire & Rubber Co., and United States Rubber Co.

These notifications mean that the labor contracts negotiated in the Summer of 1955 with these companies will be reopened on the wage question only, unless both parties agree to bargaining on working conditions. Notice for new wage talks was sent to Goodrich on May 14 and to the other three companies on May 21. Present wage rates for Goodrich workers will expire on July 14, and for the other companies on July 21, a week later. A wage increase averaging about 12¢ an hour was granted URWA workers last summer.

Although no formal demands have been made for including working conditions in these management-labor talks, the policy committee of the URWA after a meeting in early April passed a resolution establishing its economic platform for 1956 which called not only for a "substantial" wage increase, but the guaranteed annual wage, the elimination of wage differentials, the extension and improvement of many fringe benefits, and gradual transition to a uniform eight-hour work day and a 40-hour week throughout the rubber industry. At the present time some 40,000 employes in the Akron area are working a six-hour day.

It has been reported also that multi-plant companies were told that the URWA was interested in contract provisions that would provide for proportionate uniform reduction of output in plants manufacturing the same or similar products in the event a reduction of production becomes necessary.

Industry News

Harvey Firestone Outlines Company's Expansion Plans

Expansion of rubber production must be planned now if the growing world demand is to be met in the future, Harvey S. Firestone, Jr., chairman of The Firestone Tire & Rubber Co., Akron, O., recently warned.

He predicted that consumption of rubber will increase by 52% in a decade, rising from 2,891,000 long tons in 1955 to 4,400,000 tons by 1965. Automobile registrations in western Europe alone, he pointed out, have advanced by 70% between 1949 and the beginning of 1955, rising to 13,712,000 from 8,045,000.

The rubber executive's statement was made May 16 before sailing on the *Queen Elizabeth* to inspect his company's manufacturing plants in Europe. He will also attend a conference of Firestone European production executives in Brentford, England, and the one hundredth anniversary celebration of the company's affiliate in West Germany.

Mr. Firestone revealed that his company and The Goodyear Tire & Rubber Co. plan to begin building a synthetic rubber plant at Southampton, England, in cooperation with two European firms. The plant, exepected to have an annual capacity of 40,000-50,000 tons when it is completed late next year, will be owned by International Synthetic Rubber Co.

The two European companies cooperating in the venture are Dunlop Rubber, Ltd., of England, and Cie Generale des Establissements, of France.

He also said that the productive capacity of Firestone plants in Germany, Switzerland, Spain, Sweden, India, South Africa, and New Zealand has been increased about 50% in the last two years.

Firestone will develop rubber plantations in Brazil and the Philippines and replant 90,000 acres of its Liberian plantations in an effort to help meet the world's future rubber needs, he declared.

BFG to Give $300,000 to Aid Education in 1956

A $300,000 program of financial aid to higher education during 1956 has been inaugurated by The B. F. Goodrich Co., Akron, O. The money will go for student scholarships, employe tuition sharing, employe gift matching, research grants, cost-of-education grants, and other forms of assistance to several colleges and universities.

In making the announcement, John L. Collyer, Goodrich board chairman, said the purposes of the program "are to encourage young people to seek higher education and to assist them in obtaining it, to assist colleges and universities by contributing financial aid above and beyond their tuition income, and to provide added incentive for outstanding teaching and research talent to remain in university positions."

The student awards will consist of seven four-year scholarships to high school graduates in the United States who will be selected by the National Merit Scholarship Foundation. For each scholarship Goodrich will make an additional contribution to the college or university to assist the school's educational program.

Company employes taking job-connected courses will also receive monetary assistance, as will the institutions furnishing the instructional services. A similar arrangement will apply to employes attending universities, with grants to these institutions amounting in most cases to the full tuition of the student.

Goodrich will also continue to make grants to colleges and universities for research projects and studies and to retain outstanding university personnel on a consulting basis.

A final provision of the program relates to monetary gifts given to colleges and universities by company employes. The donation to the school will be matched by The B. F. Goodrich Co. up to the sum of $500.

Mr. Collyer pointed out that in addition to this $300,000 of voluntary aid to higher education, B. F. Goodrich is contributing in 1956 at least $153,000 of tax aid to publicly supported institutions of higher education in states where company plants are located.

Goodrich, Others, Praised for Management Excellence

The B. F. Goodrich Co., Akron, O., has been commended by the American Institute of Management for "the selection, active participation, and contributions of its board members, and for astute financial planning, and effective budgetary and inventory controls."

The company was cited in the Institute's "1956 Manual of Excellent Managements" as leading the rubber industry in good management during 1955. Five other rubber producers were also praised: The Firestone Tire & Rubber Co., Akron; The Goodyear Tire & Rubber Co., Akron; H. K. Porter Co., Inc., Pittsburgh, Pa.; Raybestos-Manhattan, Inc. Passaic, N. J.; and United States Rubber Co., New York, N. Y.

Goodrich was also lauded for its performance in such other management areas as economic function, corporate structure, health of earnings, service to stockowners, research and development, production efficiency, sales vigor, and executive evaluation.

The 1956 Manual altogether lists 409 American companies as excelling in management during 1955. Four thousand firms were surveyed by the Institute. The firms singled out for praise fell into one of four top categories of excellence.

In addition to Goodrich, other companies listed in the first category, of interest to the rubber industry, included General Electric Co., Schenectady, N. Y.; General Motors Corp., Detroit, Mich.; Minnesota Mining & Mfg. Co., St. Paul, Minn.; and Standard Oil Co. (New Jersey), New York, N. Y.

Among those cited in the second category were: American Cyanamid Co., New York; Armstrong Cork Co., Lancaster, Pa.; E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.; Eastman Kodak Co., Rochester, N. Y.; Food Machinery & Chemical Corp., San Jose, Calif.; Monsanto Chemical Co., St. Louis, Mo.; Phillips Petroleum Co., Bartlesville, Okla.; The Ruberoid Co., New York; Shell Oil Co., New York; and Union Carbide & Carbon Corp., New York.

Among the next listed category were the following: American Viscose Corp., Philadelphia, Pa.; Goodyear; Hercules Powder Co., Wilmington; Hooker Electrochemical Co., Niagara Falls, N. Y.; Minneapolis-Honeywell Regulator Co., Philadelphia; St. Joseph Lead Co., New York; The Timken Roller Bearing Co., Canton, O., U. S. Rubber; and West Virginia Pulp & Paper Co., New York.

The final category included: Allied Chemical & Dye Corp., New York; Archer-Daniels-Midland Co., Minneapolis, Minn.; The Borden Co., New York; Borg-Warner Corp., Chicago, Ill.; Dow Chemical Co., Midland, Mich.; Firestone; Industrial Rayon Corp., Cleveland, O.; New Jersey Zinc Co., New York; Owens-Corning Fiberglas Corp., Toledo, O.; Raybestos-Manhattan; St. Regis Paper Co., New York; and Westinghouse Electric Corp., Pittsburgh, Pa.

The "1956 Manual of Excellent Managements" is available from the American Institute of Management, 125 E. 38th St., New York 16, N. Y. The cost is $20 to non-members.

Sheller, Standard Merging

Directors of Standard Products Co., Cleveland, O., and Sheller Mfg. Corp., Detroit, Mich., have agreed on a proposal for a merger, according to a joint announcement of the two auto-parts manufacturing concerns. Standard Products will be operated as a division of Sheller. The agreement is contingent upon approval by stockholders of both firms.

Last year Sheller had sales in excess of $55 million and a net profit of $3,754,515. In the fiscal year ended June 30, 1955, Standard Products reported sales of about $37 million and a net income of $2,419,969.

Sheller produces a wide line of products, including molded and extruded rubber goods, gaskets, and screw-machine products. Standard Products makes molded and extruded rubber auto parts and other items.

According to the announcement, Tom Bradley will continue as chairman and president of Sheller; while J. S. Reid, chairman and president of Standard Products will become vice chairman and chairman of the research and development committee of Sheller.

Australian Furnace Blacks

An oil-base furnace carbon black plant will be built jointly at Geelong, Victoria, Australia, by United Carbon Co., Charleston, W. Va., and Shell Chemical (Australia) Proprietary, Ltd., the first petrochemical unit constructed in Australia and the only carbon black plant in the Southern Hemisphere.

The plant will cost $6,000,000 and will produce carbon blacks primarily for the Australian rubber industry, Oscar Nelson, Jr., United Carbon executive vice president, said in making the announcement. Some carbon black, however, will be exported to New Zealand, Indonesia, India, and other Asiatic countries.

Shell operates one of Australia's principal refineries near the projected site of the Geelong plant.

Negotiations for the project were completed by Wayne Herkness, United Carbon foreign operations officer, during a recent visit to the sub-continent, Mr. Nelson revealed.

Making Cohrlastic Abroad

Connecticut Hard Rubber Co., New Haven, Conn., has signed a ten-year royalty agreement to furnish Precision Rubber, Ltd., Bagworth, England, with technical information on the production of specialized silicone rubber and fluorocarbon plastic for aircraft parts.

In making the announcement, David S. Moffitt, vice president of the American company, said the agreement makes possible for the first time the production abroad of high-strength silicone rubber, Cohrlastic HT, developed by Connecticut Hard Rubber. The British firm's initial production will be for the British air fleet and the air forces of other NATO units.

Although silicone rubber is advantageous in aircraft applications because it remains functional at temperatures ranging from –125 to 500° F., its inherent lack of strength has until recently presented problems. Cohrlastic HT, Mr. Moffitt said, has doubled the strength of silicone rubber, placing it on a par with many organic rubbers.

Novel UCC Silicone Use

A silicone mold release agent has found a new use at the plant of a manufacturer of automobile rubber floor mats, according to Union Carbide & Carbon Corp., New York, N. Y. The company says its LE-46 Silicone Oil Emulsion has been successful in preventing the rubber sheets from sticking to machinery in several stages of production.

Pressure-Vessel Code Out

The code of standards used by the American petroleum industry for more than 20 years to build and maintain pressurized production and storage facilities will be discontinued on December 31, it was revealed by the American Society of Mechanical Engineers and the American Petroleum Institute, who jointly formulated and published the code.

The code is known to engineers as the "API-ASME Code for Unfired Pressure Vessels for Petroleum Liquids and Gases." Such vessels are used in synthetic rubber production, among other applications.

According to the joint announcement, one reason for the cancellation of the code is the growth in scope and completeness of the ASME code, which has been expanded in recent years to cover more completely the petroleum industry's pressure-vessel needs, thus removing the need of the joint code.

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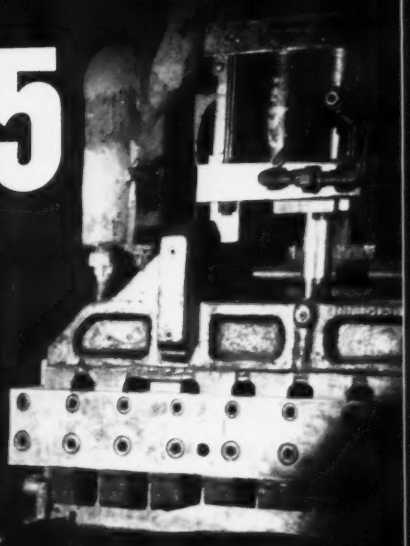

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STANDARD MICRONEX® MPC
(Medium Processing Channel)

MICRONEX W-6 EPC
(Easy Processing Channel)

STATEX-B FF
(Fine Furnace)

STATEX-M FEF
(Fast Extruding Furnace)

STATEX-93 HMF
(High Modulus Furnace)

FURNEX® SRF
(Semi-Reinforcing Furnace)

COLUMBIAN CARBON COMPANY
380 Madison Avenue, New York 17, N. Y.

Hewitt-Robins Bidding for Polyurethane Foam Market

Hewitt-Robins, Inc., Stamford, Conn., will build a 100,000-square-foot plant in Franklin, N. J., for the manufacture of polyurethane foam under licenses granted by E. I. du Pont de Nemours & Co., Inc., and Mobay Chemical Co.

In making the announcement, E. B. Gardner, Hewitt-Robins vice president, said that the company has been conducting research on polyurethane since 1952 and is currently operating a temporary plant at Long Valley, N. J., 30 miles from Franklin.

Scheduled for completion about September 1, the Franklin plant will have an annual production capacity of two million pounds of polyurethane foam. The plant will also begin production of rigid polyurethanes at a later date.

Hewitt-Robins has conducted a market research program on expected demand for polyurethane foam and is optimistic about the future of the material.

Mr. Gardner believes that although polyurethane foam is a good material for absorbing shock, it is not so comfortable or resilient as foam rubber for automobile and furniture seating and will not be able to compete in this field with foam rubber, which the company also produces.

Urges Know-How Export

Any company which has licensing arrangements abroad under patents should be prepared to supply the technical assistance to implement the patents, A. L. Freedlander, president of The Dayton Rubber Co., Akron, O., said at a panel discussion at the American Patent Law meeting in the Hotel Cleveland, Cleveland, O., April 27.

Mr. Freedlander said his firm supplies everything from advice on plant locations and building blueprints to the latest developments in rubber products, compounds, and manufacturing techniques. Dayton's foreign technical service division operates in Europe, the Near East, and South America on a fee basis, exercising no control over production in the plants.

Yale Rubber Expansion

Construction has begun on a 30,000-square-foot addition to the Sandusky, Mich., plant of Yale Rubber Mfg. Co., bringing the total manufacturing area there to 140,000 square feet, it has been revealed by E. H. Henderson, president and general manager.

The new facilities are intended for operations of the company's expanded oil seal division and other rubber-to-metal products manufacturing.

The installation of a sprinkler system for the entire plant and an additional 100,000-gallon water tower have also been started.

New Marlex Sales Office

Phillips Chemical Co., Bartlesville, Okla., has established a new district office for its plastics sales division to serve southwestern and southern states. Located in Bartlesville, the new office, the sixth in the division, will be managed by R. F. Uber, formerly Philgas sales engineer in the Denver sales division.

The company is readying commercial production of its Marlex olefin polymers at its Adams Terminal plant on the Houston Ship Channel near Pasadena, Tex.

Others of its recently announced plastics sales offices are in Los Angeles, Chicago, Akron, New York, and Providence.

Firestone Styrene Plant

The Firestone Tire & Rubber Co., Akron, O., will build a 75,000-ton-capacity plant for the manufacture of styrene at its 1,000-acre petrochemical manufacturing center near Orange, Tex., Harvey S. Firestone, Jr., company board chairman, has revealed.

The new plant will be located near Firestone's recently announced 40,000-ton-capacity butadiene manufacturing plant scheduled for completion early in 1957. The styrene facilities will be ready for operation about a year later.

"By establishing its own manufacturing facilities for both styrene and butadiene," Mr. Firestone said, "our company becomes the first in the rubber industry to produce the principal raw materials for the manufacture of its synthetic rubber."

Another Phillips Licensee

Phillips Petroleum Co., Bartlesville, Okla., has licensed Societe Solvay et Cie, a Belgian firm having an operating office in Italy, to use in Italy the new Phillips-developed process for making rigid polyethylene.

The agreement grants Solvay et Cie exclusive use in Italy of Phillips' patents and technical knowledge for producing these new plastics. The Belgian company, with headquarters in Brussels, is a leading European manufacturer of various chemical products, including plastics.

New G-E Waterford Land

Acquisition of more than 60 acres of adjacent land has been announced by the silicone products department of General Electric Co., Waterford, N. Y. Bringing the overall plant site to more than 160 acres, the new acreage will provide space for a future expansion of the facilities, according to Charles E. Reed, general manager of the department.

The Waterford plant is a completely integrated silicone production unit, making basic chemical intermediates and silicone gums, rubbers, resins, emulsions, and specialties. Its capacity has been increased several times since operations started there in May, 1947.

Sees Market Research Lag

Research in marketing has not kept pace with research in manufacturing, William S. Richardson, president, The B. F. Goodrich Co., Akron, O., told a recent meeting of the Seattle Sales & Advertising Club.

"When you consider the billions of dollars spent on product research and development and on engineering research and development, it is a sad commentary on our economy that we spend, by comparison, only a few cents on research in communications, selling, and distribution," the Goodrich executive declared.

Advocating more pretesting of advertising appeals, formats, methods, and media, Mr. Richardson said that the challenge facing the communications industry is to effect the production of "more sales per person and more sales per dollar of advertising investment."

RMA O-Ring Chairmen

Committee chairmen for 1956 in the O-ring subdivision of The Rubber Manufacturers Association, Inc., have been announced by T. B. Keenan, Plastic & Rubber Products Co., general chairman of the O-ring group.

They are R. W. Carlson, Minnesota Rubber & Gasket Co., industrial standards committee; E. N. Cunningham, Precision Rubber Products Corp., military standards committee; W. J. Johnson, Goshen Rubber Co., Inc., standards and technical committee; F. A. Lewis, Linear, Inc., business ethics committee; and T. J. McCuistion, Parker Appliance Co., membership and publicity committee.

Typical of the work of the O-ring subdivision, Mr. Keenan says, is the determination of silicone shrinkage characteristics now in progress.

Harwick Plant Addition

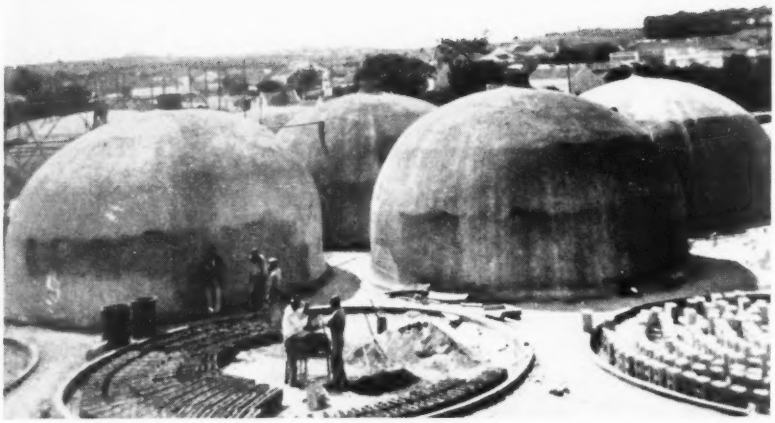
Harwick Standard Chemical Co., Akron, O., has begun construction of a $250,000 building addition to its plant there which will provide another 33,000 square feet of floor space for office, warehouse, and manufacturing facilities.

The new building is needed to accommodate expanding sales, the company says, and will add 60% more floor area to the Akron plant. The original facilities were built in 1948.

Offers Horse Head TiO_2

New Jersey Zinc Sales Co., New York, N. Y., has begun full-scale production of its Horse Head titanium dioxide at its Gloucester City, N. J., plant. The white pigment, at present available in nine grades, is suggested for the compounding of white and tinted rubber goods, plastics, latex and emulsion paints, and other goods.

The company is getting titanium-bearing slag, raw material for the pigment, from Quebec Iron & Titanium Corp., which it partially owns.



Wine vats at Bombarrel, Portugal, built last year through the Airform process. In the background are completed concrete structures. Workers in foreground are laying the foundation for a unit. Concrete will be sprayed over an inflated neoprene-nylon balloon rigged just inside the circular perimeter

Portugal Building 5,000 Airform Wine-Storage Tanks

The Portuguese Government has contracted with an American manufacturer for the construction of 5,000 Airform wine-storage tanks, it was revealed by the Goodyear Tire & Rubber Co., Akron, O., maker of the neoprene-nylon fabric balloons to be used in the Airform building technique.

In the technique, the balloon is inflated over a foundation ring, covered with wire reinforcing, and sprayed with Shotcrete, a mixture of sand, cement, and water, to an average thickness of two inches. When the shell has hardened, the bag is deflated, removed, and used in the forming of additional units.

The Airform construction system is patented by Adolph K. N. Waterval, of Alexandria, Va. Half-barrel, spherical, cylindrical, elongated, and semi-spherical shapes can be erected. The technique has already been used to make houses in the United States.

The Portuguese units will be hemispherical, and each will have a 73,600-gallon wine capacity. Government wineries there built 50 of the vats last year.

Hewitt-Robins Two-Mile Conveyor System Planned

A giant conveyor system that will generate its own electrical power and set new speed records for material handling will soon be built to move 30 million tons of gravel from a Utah hill into Great Salt Lake, according to Hewitt-Robins, Inc., Stamford, Conn., who will design and manufacture the nearly-two-mile-long conveyor.

The gravel will be used in constructing a 13-mile roadbed for the Southern Pacific Railroad across the lake, replacing a 52-year-old trestle mounted on wood piles. The earth-moving operation is scheduled to start next October and is expected to be completed in 26 months.

The conveyor system will handle gravel at an average rate of 75,000 tons a day, called a U. S. record for overland conveyors. The speed of the belts will be 800 feet a minute, exceeding usual belt speeds by 300 to 400 feet a minute.

A Hewitt-Robins drive mechanism will be used to start the conveyor and control its speed. The energy created by the gravitational glide will be converted into electrical power by the motors, which in effect will become electrical generators.

The wiring system will be arranged to capture this surplus power and feed it to three electric shovels to supplement the power required in digging the gravel out of the hill. The drop in altitude from the gravel hill to the lake will be 400 feet.

The conveyor system will cost more than $1,700,000; the entire construction project, $49,000,000.

The first stage of the conveyor will be 54 inches wide; the second stage, 72 inches wide.

Firestone Philippine Plant

Plans for the construction of a $5,300,000 tire and tube manufacturing plant and the establishment of a 1,000-acre rubber plantation in the Philippines have been announced by Harvey S. Firestone, Jr., board chairman of The Firestone Tire & Rubber Co., Akron, O.

The plant will be located in the Manila area and will have about 115,000 square feet of floor space. Production capacity is estimated at 100,000 passenger car and truck tires a year. Incorporated as Firestone Tire & Rubber Co. Of The Philippines, the plant will be the Firestone organization's fourteenth outside the United States.

There are about 115,000 motor vehicles on the island.

United Carbon Elects

T. A. Whelan has been elected president, and S. C. Coleman chairman of the board of United Carbon Co., Charleston, W. Va. The elections followed the recent resignation of Thorne F. Koblegard as president, who remains, however, a member of the company's board of directors and executive committee.

In addition, Oscar Nelson, Jr., was chosen president of three United Carbon subsidiaries—United Carbon Co., Inc.; United Producing Co., Inc.; and United Rubber & Chemical Co. He retains his post of executive vice president of United Carbon Co.

Mr. Whelan is head of the Citizen's Bank of Weston, W. Va., and has been a company officer since the founding of the company in 1925. He will retain his post as treasurer and will continue as a member of the executive committee.

Mr. Coleman is a partner of E. F. Hutton & Co., New York City brokerage firm, and has been a member of the board of United Carbon for 19 years.

L & N Opens New Plant

The new North Wales, Pa., instrument-manufacturing plant of Leeds & Northrup Co., a single-story structure containing 275,000 square feet of floor space, costing $11,000,000, and employing 1,300 people, was formally opened for public inspection on May 11.

The plant produces automatic industrial instruments, including Speedomax recorders and recorder-controllers, Metermax combustion control, and L & N load-frequency control.

The company's main manufacturing unit is in Philadelphia, Pa.

New Avisco Products Seen

Crimpable fibers for textiles and a fibrous rubber product for use as rug underlays have been developed by American Viscose Corp., Philadelphia, Pa., Herschel H. Cudd, vice president, told the annual meeting of company stockholders, May 7.

The crimpable fibers have long been wanted by the textile industry, Dr. Cudd said. The product is handled as a regular fiber, but develops a permanent crimp when wet with water. It is now being put into commercial production.

The fibrous rubber is a porous, nonskid, tear-resistant material which has proved to be practical for rug underlays. Other uses for the product are being explored. It will soon be put into semi-commercial production.

Among the other projects at Avisco's research and development division described by Dr. Cudd were a super-strength tire yarn, now in commercial production; a new viscose textile filament, spun-dyed for carpets; an improved rayon staple with greater wet strength for industrial uses; the expansion of the color range in spun-dyed acetate yarns; and several new coatings for Avisco cellophane.

C-S $TiCl_4$ Plant Starts

The 35,000-ton-a-year titanium tetrachloride plant of Columbia-Southern Chemical Corp., Pittsburgh, Pa., has begun operations. Located on a seven-acre tract of land in Natrium, W. Va., the plant is integrated with the company's large chlorine-producing facilities there.

Titanium tetrachloride is a clear liquid used by titanium metal producers in a chemical process to produce titanium sponge. Chlorine is reacted with a titanium-bearing ore in specially designed equipment, yielding a crude grade of titanium tetrachloride requiring several purification steps. The liquid titanium tetrachloride is reacted with another metal to produce the sponge.

To Yield Hooker-Detrex

Hooker Electrochemical Co., Niagara Falls, N. Y., will sell its capital stock in Hooker-Detrex, Inc., to Detrex Corp., Detroit, Mich, it has been revealed by Bjarne Klaussen, president of Hooker.

Hooker-Detrex, owned jointly by Hooker Electrochemical and Detrex, was incorporated in 1946 for the production of chlorinated solvents, primarily trichlorethylene, a metal-degreasing solvent. It operates a plant in Tacoma, Wash., and one in Ashtabula, O. Both plants have been under the supervision of Hooker, with product marketing being handled by Detrex.

It is expected that the transfer of Hooker's stock in the company will involve the acquisition of the Tacoma plant by Hooker. The Ashtabula plant will be taken over and operated by Detrex. Although details of the agreement have not yet been worked out, completion of the transfer is expected by early July.

Another Polyolefin Licensee

Phillips Petroleum Co., Bartlesville, Okla., has licensed Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany, to use Phillips' catalytic process for making polyethylene and other polyolefin plastics. The agreement gives BASF exclusive use in Germany of the American firm's patents and technical knowledge for producing these polyolefins.

The German company is one of Europe's major manufacturers of chemicals and plastics.

Vinyl Electrical Tape Line

A complete line of vinyl electrical tape is being offered by Quaker Rubber Division of H. K. Porter Co., Inc., Philadelphia, Pa. Trade named Porter, the tape is recommended in place of friction and rubber tape where abrasion exists, or where tape is subjected to water, acids, alkalies, or corrosion.

Tested to 10,000 dielectric volts, the tape is available in both 8- and 10-mil. thicknesses in a variety of sizes. It carries the Underwriters Seal of Approval.

Seiberling Incumbents Keep Control after Proxy Vote

Seiberling Rubber Co., Akron, O., has defeated the bid of Edward Lamb, Toledo investor, to wrest control of the 34-year-old company from the Seiberling family.

The count of stockholders' proxies was made at the firm's annual meeting in Akron, April 23, culminating a bitter two-month battle. Almost 300,000 votes were chalked up for the incumbent management, about four times the number of votes garnered by Mr. Lamb and his associates.

Later, J. P. Seiberling was reelected president and chairman of a 15-man board of directors. Mr. Lamb, now the company's largest single stockholder, was given a seat on the board, as were three of his associates.

He pledged cooperation with the rest of the board of directors and said he thought the proxy fight had been a good thing for having revived the stockholders' interest in the company. He said he believed the company had great opportunities for expansion.

Asked whether he would conserve dividends to get funds for more research and expansion, he said Seiberling has always had a chronic shortage of working capital and should rearrange its financing and get long-term loans.

Also elected by the board was Harry P. Schrank, production vice president since 1936, to executive vice president. Reelected, in addition to J. P. Seiberling, were L. M. Seiberling, vice president, sales; R. J. Thomas, vice president and treasurer; C. E. Jones, vice president and comptroller; W. P. Seiberling, secretary; H. E. Thomas, assistant secretary-treasurer; and R. L. Perkins, assistant secretary and counsel. Replacing Mr. Schrank as production division head is Frank Kovacs, formerly his assistant.

Mr. Schrank is vice president and director of Copolymer Rubber & Chemical Corp., Baton Rouge, La., and vice president of the board of the University of Akron.

Tyer Celebrates Century of Molded Rubber Producing

Tyer Rubber Co., Andover, Mass., is celebrating its one-hundredth anniversary as a manufacturer of molded rubber products.

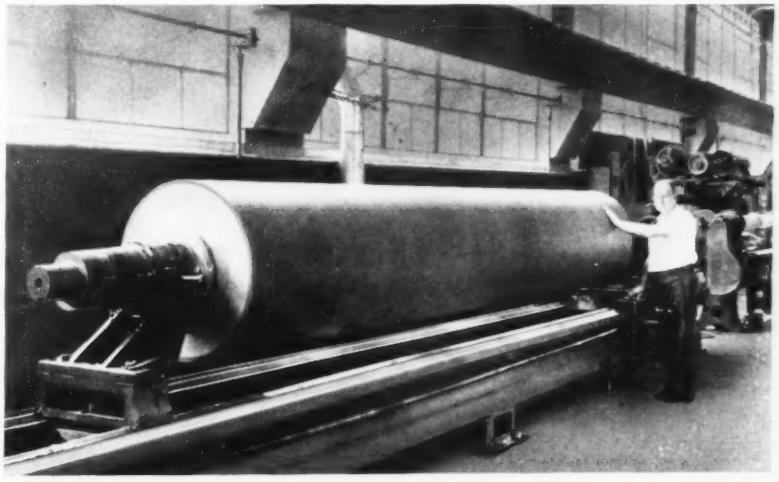
Founded in 1856 by Henry George Tyer, an Englishman who came to this country in 1841, the firm has grown from a small shop employing six people to its current multi-million-dollar business operated by more than 1,000 engineers, chemists, and production-line personnel.

Originally established to make a single product, an overshoe, the company now manufactures rubber and canvas footwear, sporting goods, rubber-covered rolls, and such wide-ranging molded rubber items as propeller blade heaters, gaskets and grommets for air conditioning units, auto and truck diaphragms and shock insulators, components for electronic and electrical equipment, and rubber parts for shoe machinery.

Early in the company's existence it experimented with the manufacture of a variety of since-discontinued goods, including druggists' and medical sundries and automobile tires. Tyer hit its stride in 1926 with rubber-covered rolls. By 1953 demand for these products enabled the firm to build a 40,000-square-foot building adjoining its main plant to specialize in their manufacture.

During World War II, Tyer converted to war production and turned out pontoons, reconnaissance boats, raincoats and ponchos, earplugs, rubberized fabric clothing and food bags, flotation bladders, extruded tubing, surgical goods, and many other items.

Hundreds of thousands of dollars were invested in new equipment and processes during the post-war period. The plant, consisting of several buildings, now occupies 350,000 square feet of space.



A completed rubber-covered roll for a papermaking plant is inspected by workman at Tyer Rubber Co.'s Andover plant

Improved Light-Stable Vinyl

The development of a new light-stabilizing system for vinyl, which has withstood 5,600 hours of accelerated artificial weathering before failure, has been announced by the organic chemicals division of Monsanto Chemical Co., St. Louis, Mo.

Joseph R. Darby, group leader in charge of plasticizer application research, said that outdoor confirmatory tests on the new system are not entirely complete owing to the excessive time factor involved, but they indicate that the new stabilization provides about three times the outdoor durability obtainable heretofore in vinyl plastic.

He said the increase in light stability was attributable to the proper combination of resin, plasticizers, and a complex, four-part stabilizer system which is significantly impaired by the omission of any one of the parts. He described the stabilizer parts as barium-cadmium, an epoxidized soybean oil, and antioxidant, and an organic additive.

All of the system's components are available commercially and at a cost only slightly higher than present stabilization systems, Mr. Darby declared. Although Monsanto does not produce or sell stabilizers, it has made patent application on the stabilizing system as it did in the case of the heat stabilization system it introduced in 1951. The latter is used in an estimated 75% of transparent vinyl film formulations.

Paraplex G-62 Non-Toxic

Paraplex G-62 has been approved by the government as a plasticizer in synthetic plastic films for packaging meat products, fruits, and vegetables, according to Rohm & Haas Co., Philadelphia, Pa. manufacturer of the plasticizer.

The plasticizer was deemed non-toxic by the Food & Drug Administration, Department of Health, Education & Welfare and the Meat Inspection Branch, United States Department of Agriculture. Approval by the latter included use of Paraplex G-62 up to 35% of the total compound.

O-Ring Manual Available

A 32-page booklet, "Visual Inspection Guide for Rubber O-Rings," has been compiled by the Bureau of Ships with the cooperation of The Rubber Manufacturers Association, Inc., New York, N. Y.

The manual is intended to bring together in a single source the most authoritative criteria for the visual inspection of rubber O-rings and to assist government inspectors, among others, in determining what constitutes a uniform, acceptable quality of product.

The booklet contains 28 photographs of typical visual defects, definitions of defects, and suggestions for inspecting O-rings. It is available from the Bureau of Ships, United States Navy Department, Washington 25, D. C. Cost is 50¢.

Expanding Vinyl Resin Plant

The Ashtabula, O., vinyl resin plant of The General Tire & Rubber Co., Akron, O., is undergoing an expansion that will boost its productive capacity by 50%, according to P. J. Wallace, recently appointed plant manager.

The current output of the 18-month-old plant was put at 25 million pounds. The expansion will entail structural additions to the finishing and polymer buildings and the installation of a giant rotary dryer to supplement the present one, five additional reactors, and two more 14,000-gallon blending tanks, Mr. Wallace said.

George H. Martin

Plaskon Canadian Sales

Establishment of new and expanded sales-engineering services for its Plaskon plastics has been announced by The Barrett Co., Ltd., Montreal, P.Q. The additional facilities make for faster product deliveries and more extensive application engineering assistance to the Canadian plastics industry, the company explained.

Appointed Plaskon sales manager for the Montreal and Toronto districts was George H. Martin.

Hercules Research Center

The central research laboratories of Hercules Powder Co., Wilmington, Del., completed their twenty-fifth year of operation in April, the company reveals. Personnel at the laboratories has grown from an initial staff of 125 to a current 750, and annual expenditures have increased from $450,000 to almost $8,000,000.

Now known as Hercules Research Center, the laboratories are under the direction of Peter Van Wyck. There are nearly 17,000 technical volumes in the Center's library, for which a new million-dollar building is now being erected. The library serves as a starting point for exploratory research and a check-point for all phases of research and development.

Test Terra-Tire on Plane

Successful testing of its barrel-shaped, low-pressure Terra-Tires on a light airplane has been announced by the aviation products division of The Goodyear Tire & Rubber Co., Akron, O.

The plane, a Stinson Voyager, was equipped with two 24-inch-wide flat-sided Terra-Tires, each operating at 3-8 psi. air pressure. The plane landed and took off on sod and concrete at Akron Municipal Airport. Future tests will be made on plowed fields, rough clearings, snow-covered areas, and marshy and sandy regions.

According to Goodyear, advantage of Terra-Tires over conventional airplane tires is that their thin, pliable walls, combined with extremely low pressure, enable the tires to conform with uneven surfaces and to glide over soft surfaces without bogging down.

Axle-driven Terra-Tires are being used on trucks, trailers, and other off-the-road vehicles.

Research Cost Seen Rising

About $15 billion have been spent for research and development in the United States during the past three years, John R.Hoover, president of B. F. Goodrich Chemical Co., Cleveland, O., told the Annual Conference for Engineers & Architects, held last month at Ohio State University.

This amount was about 40% of the total business capital spending planned for 1956, and research expenditures are increasing at the rate of 10% a year, the chemical executive said.

"Research deliberately causes obsolescense," he declared.

To Boost TiO_2 Production

New Jersey Zinc Co., New York, N. Y., is contemplating expansion of its recently acquired Gloucester City, N. J., titanium dioxide plant. The possibility of building a new plant to meet the rising demand for the white pigment was also announced, although details of the project were not revealed.

U. S. consumption of titanium dioxide has grown from 300,000 tons in 1950 to 400,000 tons last year, New Jersey Zinc says.

Wall Cove Compounds

Two wall cove formulations in the preferred Shore A durometer hardness range of 90-100 are being made available for home, office, and industrial construction by Barrett Division, Allied Chemical & Dye Corp., New York, N. Y.

Designated Barrett Compound Nos. 3099-D and 3099-F, they are said to consist of large proportions of reclaimed rubber and fillers, with selected softeners, in order to provide economy, smooth processibility, and the preferred hardness. Both contain butadiene-styrene copolymer.

News About People

J. Kenneth Craver has joined the research and engineering division of Monsanto Chemical Co., Dayton, O. He will head a special applications research program for the division's chemical research department.

Thomas G. MacGowan has been appointed director of advance planning for The Firestone Tire & Rubber Co., Akron, O., and is succeeded as manager of the firm's marketing research department by **John T. Cahoon,** assistant manager since 1950. Mr. MacGowan joined Firestone in 1939 as a market analyst.

Hyle F. Webb has been named manager of manufacturers sales for the western division of The Goodyear Tire & Rubber Co., Inc., Akron, O., succeeding **E. T. Rainey** in Los Angeles. **James G. Gates** succeeds Mr. Webb as account executive in Kansas City, relinquishing his post as manager of industrial tire sales to **Edward Raymond,** who in turn is replaced as manager of truck tire sales by **Raymond F. Brewer.**

V. A. Pardo and **J. M. Petrillo** have been assigned to sales promotion posts in the chemical industries sales division of Foxboro Co., Foxboro, Mass. Other sales promotion assignments include **R. C. Tamm,** to the metals industries division; **E. N. Hayes,** to manager of the refinery industries division; **C. R. Fleming,** to the power industries division; and **J. W. Peirce,** to the metals industries division.

Arthur S. Weygandt has been appointed manager of the central development department of the chemical divisions of Food Machinery & Chemical Corp., New York, N. Y. Also named was **William D. Morrison,** to manager of foreign chemical development for the chemical divisions.

S. Philip Marcus has been named business manager of the new Princeton, N. J., central research laboratory of Food Machinery & Chemical Corp., chemical divisions, New York, N. Y.

Cliff Utter has joined Stoner Rubber Co., Anaheim, Calif.

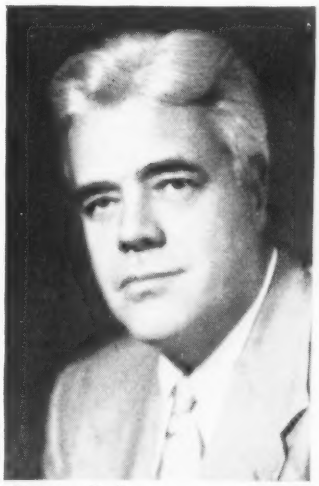
James K. Buckwalter, general sales manager for Wooster Rubber Co., Wooster, O., has been named vice president in charge of sales, and **Donald E. Noble,** secretary and treasurer, has been appointed vice president in charge of finance.

E. Dorrance Kelly, director of the Office of Synthetic Rubber of the Federal Facilities Corp. from 1952 to 1955, has joined the staff of the synthetic rubber and latex division of The Firestone Tire & Rubber Co., Akron, O. He will be given special assignments relating to the production and distribution of the company's synthetic rubber.

Chase Ltd., Photo

E. Dorrance Kelly

E. Wayne Haley has been appointed assistant to the president of Columbia-Southern Chemical Corp., Pittsburgh, Pa., and will headquarter at the company's New York, N. Y., office.



Blackstone Studios

E. Wayne Haley

E. J. Thomas, president and chief executive officer of The Goodyear Tire & Rubber Co., Akron, O., has been named to represent the rubber products industries on the National Advisory Council for the national industrial exposition of new industrial products, methods, and research developments to be held in Detroit, Mich., October, 1956.

Randolph W. McGahey and **Herbert H. Fink** have been named managers of all belt and hose technical activities, respectively, including development and field engineering, for B. F. Goodrich Industrial Products Co., Akron, O.

James E. Faulkner and **Arthur C. Koenig** have been promoted to manager and chief engineer, respectively, of the plantations division of The Firestone Tire & Rubber Co., Akron, O. Mr. Faulkner continues as assistant treasurer of Firestone Plantations Co., a Liberian subsidiary.

Norman P. Phillips has been appointed technical sales representative for the Gen-Flo paint latex of The General Tire & Rubber Co., Akron, O.

Albert E. Forster, president and chairman of Hercules Powder Co., Wilmington, Del., has received the 1956 Memorial Award of the Chemical Market Research Association for his contributions to market research in the chemical industry.

Charles S. Stone has been advanced to Pittsburgh district manager of B. F. Goodrich Tire & Equipment Co., Akron, O., succeeding **William H. Campbell,** who becomes manager of truck tire sales at Akron.

John T. Clark has been transferred to the Joplin, Mo., sales service office of Eagle-Picher Co., Cincinnati, O., and has been succeeded as the chemical division's sales representative in Cincinnati by **John E. Gulick,** formerly at the New York, N. Y., sales office.

C. Jos. Malott

John T. Clark

F. E. Richardson

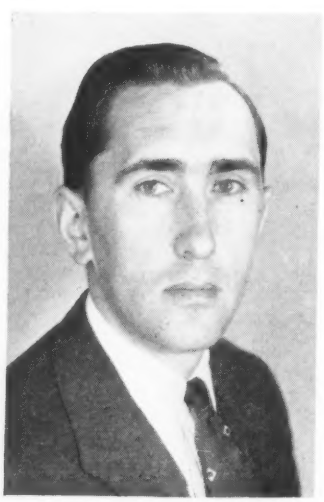
F. E. Richardson has been advanced to manager of the Memphis, Tenn., plant of Velsicol Chemical Corp., Chicago, Ill. He has been with the company since 1948.

Evart W. Wright has been named manager of molded and extruded products for B. F. Goodrich Industrial Products Co., Akron, O.

Bernhard Larsen has been appointed rubber chemicals and synthetic rubber technical representative in the Akron, O., area for Naugatuck Chemical Division of United States Rubber Co., Naugatuck, Conn. He replaces **E. H. Nahm,** who has retired after 29 years of service with the company.

James Burton is now with Wesco Co., Los Angeles, Calif.

Rolf Fialla has been appointed European technical service director of Colombian Carbon Co., New York, N. Y., with headquarters in Zurich, Switzerland.



Rolf Fialla

Joseph E. Dierkes has joined the colloidal dispersions unit of Columbian Carbon Co., New York, N. Y., and is in charge of control and production at the firm's new Tacony plant.

John L. Collyer and **Harvey S. Firestone, Jr.,** board chairmen of The B. F. Goodrich Co. and The Firestone Tire & Rubber Co., respectively, were members of the 150-man committee which planned the dinner given by the National Conference of Christians and Jews at the Waldorf-Astoria, June 6, to honor Henry R. Luce, editor-in-chief of the magazines *Time, Life,* and *Fortune,* for his "distinguished service in the field of human relations."

C. E. Wilson has been appointed sales manager for Pacific Moulded Products Co., Los Angeles, Calif., succeeding **Charles D. Thurmond,** who has become associated with Richfield Oil Co., Los Angeles. **Robert Muth** has been named production manager for Pacific Moulded.

Robert M. Gatti and **Richard L. Gruber** have been named manager and sales and service engineer, respectively, of the Cincinnati office of Richardson Scale Co., Clifton, N. J.

Jack T. Kidney, manager of the employes service division of The Goodyear Tire & Rubber Co., Akron, O., was named "Safety Man of the Year" at the thirteenth annual Greater Akron Safety Conference.

Harry T. Goodenberger has been assigned to the staff of the auto tire sales department of The Goodyear Tire & Rubber Co., Akron, O.

Glen E. Wilson has been named director of employe relations for Goodrich-Gulf Chemicals, Inc., Cleveland, O.

Albert J. Gracia, formerly general manager of Goodyear Atomic Corp., has been awarded the P. W. and Florence B. Litchfield Special Award of Merit, called the most coveted award of The Goodyear Tire & Rubber Co., Akron, O., of which Goodyear Atomic is a subsidiary. Mr. Gracia was cited for putting the Atomic Energy Commission's Pike County, O., gaseous diffusion plant into efficient operation. He is presently Goodyear's manager of research and development.

John M. Snider has joined the laboratory staff of Henry Co., Los Angeles, Calif., and will be in charge of research for aircraft sealants.

Roy Van Ness has been appointed manager of packing, special products, and matting sales for United States Rubber Co., New York, N. Y.

Charles V. Glynn has been named assistant treasurer and controller of U B S Chemical Corp., Inc., Cambridge, Mass.

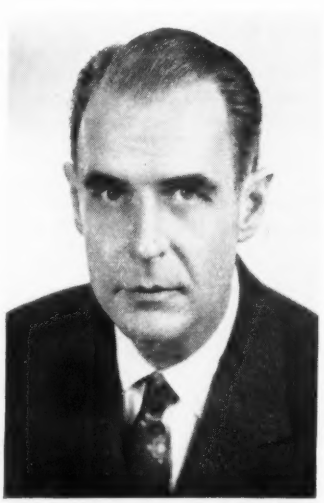
Charles F. Wimmer

Charles F. Wimmer, technical sales representative for the rubber chemicals division of Phillips Chemical Co., Bartlesville, Okla., has been transferred from the Akron area to the western district office at Chicago, Ill.

K. L. Parmelee and **Duward Neal** have been appointed assistant managers of the mileage sales department and the accessories and repair materials sales department, respectively, of Seiberling Rubber Co., Akron, O.

James T. Fairclough, Jr., and **Robert Dudley** have been assigned as sales representatives to the latex and lotol department of Naugatuck Chemical Division, United States Rubber Co., in the Georgia and Philadelphia areas, respectively.

Charles B. Ryan, advertising manager for The Firestone Tire & Rubber Co., Akron, O., has been named to the newly created position of general advertising and merchandising manager.



Charles B. Ryan

John T. Blake

Harry N. Stevens

Stephen S. Easter

John T. Blake, director of research for Simplex Wire & Cable Co., Cambridge, Mass., has been advanced to vice president and plant manager. Co-author of "Chemistry and Technology of Rubber," Dr. Blake is a past chairman of the division of Rubber Chemistry, ACS, and a Goodyear Medal winner.

M. Jane Ferguson and **E. Ray Hooser** have joined the staff of The B. F. Goodrich Co. Research Center, Brecksville, O., as junior technical man and analytical chemist, respectively. Also appointed to the Center's staff were **James R. Miller,** as research chemist, and **Samuel J. Caprette, Jr.,** as technical man in the technical service research group. **Jerard Sindelar,** a member of the staff since 1946, has been assigned to the chemical engineering research and development department.

Eugene L. Craig has been named vice president in charge of sales for Goodrich International Rubber Co., Manila, The Philippines. He was formerly general manager of the Puerto Rico branch of International B. F. Goodrich Co.

Harry N. Stevens, associated with The B. F. Goodrich Co., Akron, O., since 1935, has been named director of research operating. He was formerly research coordinator at the company's Brecksville, O., research center.

Richard K. Mattocks has been named assistant sales manager of Minnesota Rubber & Gasket Co., Minneapolis, Minn. **Robert Wilson** and **Eugene Fischer** have been appointed manager and associate manager, respectively, of the company's New York, N. Y., sales office. Other recent sales appointments are **William Grotenrath,** to manager of the Cleveland, O., office; **William Grotenrath, Jr.,** to technical servicer at Cleveland; **Curtis Beam,** to manager of the Kansas City, Mo., office; **Harold Moorehead,** to Philadelphia, Pa., assistant district manager; and **Eugene Raemdonck,** to St. Louis, Mo., assistant district manager.

Wyn McCoy has been advanced to sales promotion manager in the industrial division of The Timken Roller Bearing Co., Canton, O.

James A. Winter has been appointed director of sales for Velsicol International Corp., New York, N. Y., and **Stephen S. Easter** has been named director of technical sales. Both were formerly with Velsicol International's parent company, Velsicol Chemical Corp., Chicago, Ill.

Willard Haas has been named senior development engineer by B. F. Goodrich Industrial Products Co., Akron, O., and will be responsible for field engineering and development of all of Goodrich's hose.

Charles L. Lightfoot, Jr., assistant manager of government contracts in the development department, research and engineering division, of Monsanto Chemical Co., St. Louis, Mo., has been advanced to manager of new product development in the department.

C. F. Thomas, divisional manager of the industrial fabrics department of Turner Halsey Co., New York, N. Y., has been appointed vice president.

Eugene L. Craig

Wyn McCoy

C. F. Thomas

Nelson G. Ball has been appointed director of personnel for The Goodyear Tire & Rubber Co., Akron, O., and has been succeeded as factory personnel manager by **Randolph B. West, Jr. Kenneth L. Reynolds** replaces Mr. West as assistant factory personnel manager. Also advanced were **Joseph Mayr,** to manager of the efficiency department; **Ernest F. Fortney,** to manager of the labor division; **P. S. Gould,** to manager of administrative engineering; and **J. Walter Rogers,** to assistant maanger of administrative engineering.

M. J. Skeeters has been promoted to manager of research for the chlorinated products division of Diamond Alkali Co., Cleveland, O. Also advanced in the division are **Alex Hlynsky,** to divisional group leader for research, and **Robert J. Orlik,** to sales promotion representative for agricultural chemicals.

William A. Holub, Jr., has joined Mobay Chemical Co., St. Louis, Mo., as personnel supervisor.

D. R. Mackie, for 32 years associated with Monsanto Chemicals, Ltd., London, England, has been appointed managing director of the firm.

John R. Jones has been advanced to field sales manager for the sundries department of B. F. Goodrich Industrial Products Co., Akron, O.

Langley W. Isom has joined the Vulcan Rubber Products Division of Reeves Brothers, Inc., New York, N. Y., in an administrative capacity.

R. P. Donnell has been promoted to New York, N. Y., district manager of the steel and tube division of The Timken Roller Bearing Co., Canton, O.

Willard E. Williams has been named manager of sales training for B. F. Goodrich Industrial Products Co., Akron, O.

Paul J. Sandridge has been promoted to sales manager of special accounts for The Mansfield Tire & Rubber Co., Mansfield, O.

William S. Richardson, president, The B. F. Goodrich Co., Akron, O., has been reelected a board member of the National Industrial Conference Board.

D. W. Thornburg has been promoted to sales engineer in the New York district office of the plastic sales division of Phillips Chemical Co., subsidiary of Phillips Petroleum Co., Bartlesville, Okla.

Webster N. Jones, formerly dean of engineering and science at Carnegie Institute of Technology, has joined Pittsburgh Plate Glass Co., Pittsburgh, Pa., as advisor in its industrial relations department.

Stuart D. Brewer has been appointed manager of resin product engineering, and **Frederick M. Lewis** has been named manager of advance development in the engineering section of the silicone products department of General Electric Co., Waterford, N. Y. Also appointed in the engineering section are **Abbott Pozefsky,** to manager of the analytical and control methods unit, and **William F. Gilliam,** to specialist in technical information exchange.

D. K. Usher has been appointed manager of the foam products sales division of The Goodyear Tire & Rubber Co., Akron, O. Also named in the division were **K. J. Learey,** to assistant manager; **J. B. Emack, Jr.,** to manager of field sales; **Thomas Kerr, Jr.,** to manager of eastern field sales; **D. E. Oakes,** to manager of western field sales; **W. M. Hunter,** to manager of central field sales; and **J. B. Wiland,** to manager of the Akron office section.

(Left to right) E. W. Peterson and David W. Stapleton

David W. Stapleton has been elected president of Stowe-Woodward, Inc., Newton, Mass., succeeding **E. W. Peterson,** who becomes chairman of the board. Mr. Stapleton has been executive vice president since 1954.

W. K. McPherson has been appointed plant manager, **Walt Woodward** assistant general manager, and **Ralph Rector** sales manager of the molded products division of Stauffer Chemical Co., Los Angeles, Calif.

Fred D. Campbell has joined Golden West Rubber Products, Inc., Los Angeles, Calif., as general manager, succeeding **Fran L. Beiter,** who has become associated with Commercial Rubber Co., Los Angeles, as general manager.

Robert E. Spoerl has been appointed chief sales engineer for the conveyor and elevator belting department of United States Rubber Co., New York, N. Y.

Ross M. Sims has been advanced to plant manager of the Moundsville, W. Va., plant of National Aniline Division, Allied Chemical & Dye Corp., New York, N. Y.

Robert E. Lenz has been advanced to assistant director of the chemical research department, research and engineering division, Monsanto Chemical Co., St. Louis, Mo. He will headquarter in Dayton, O.

William S. Richardson, president, The B. F. Goodrich Co., Akron, O., has been elected chairman of the National Highway Users Conference, succeeding **Albert Bradley,** chairman of the board, General Motors Corp., Detroit, Mich.

Alan A. Weinberg and **Bruce N. Wilson** have joined the staff of the plastics laboratory, research and development department, Hooker Electrochemical Co., Niagara Falls, N. Y.

Earl W. Haefner has been appointed assistant to the president of Borg-Warner International Corp., Chicago, Ill. Colonel Haefner was formerly with the General Staff of the United States Army.

R. L. McCann, president, The New Jersey Zinc Co., New York, N. Y., has been awarded the sixteenth annual L-in-Life award of the Lehigh University Club of New York.

Ralph Brooks has become sales representative to the western Oregon and Washington territories for Wellco Shoe Corp., Waynesville, N. C., succeeding **Jay Rackam,** who has retired.

Rhea P. Lapsley has been advanced to vice president in charge of research and product development for Okonite Co., Passaic, N. J.

E. C. Wurzinger has been elected an assistant secretary of United States Rubber Co., New York, N. Y. He joined the company in 1933.

M. E. Schiller has been promoted to operating manager, films and flooring division, The Goodyear Tire & Rubber Co., Akron, O.

Robert J. Witte has been appointed advertising manager of American Latex Products Corp., Los Angeles, Calif.

J. William McCrackin has become a technical service representative for Mobay Chemical Co., St. Louis, Mo. He was formerly a general manufacturing superintendent at the John F. Queeny plant of Monsanto Chemical Co.

George McCoy has been promoted to manager of the research and development department of Pennsylvania Salt Mfg. Co., Philadelphia, Pa. He joined the company in 1944.

A. Eugene Williams has been named manager, rubber hose and extruded goods division, Swan Rubber Co., Bucyrus, O.

Wilson C. Keyes has been promoted to assistant plant manager for Velsicol Chemical Corp., Chicago, Ill., and has been succeeded as production superintendent by **John Rex,** formerly technical assistant to the plant manager. **Robert Tiefel** has been named assistant superintendent of the reduction area.

Robert D. Thomas has been named manager of the tire sales department of The Firestone Tire & Rubber Co., Akron, O., and has been succeeded as the department's central division sales manager by **Charles H. Hahn,** formerly manager of the Buffalo sales district. Mr. Thomas is the son of the late John W. Thomas, Firestone's first chemist and later its president, chairman, and honorary chairman.

W. E. Weller has been appointed operating manager, foam products, of The Goodyear Tire & Rubber Co., Akron, O. He was formerly operating manager for the firm's films, foam, and flooring division.

William Ikray has joined Pacific Moulded Products Co., Los Angeles, Calif., as manager of production control.

A. N. Wohlwend has joined Escambia Bay Chemical Corp., Cambridge, Mass., as director of commercial development. He previously held a similar position with Stauffer Chemical Co.

Willard C. Gulick, president, International B. F. Goodrich Co., Akron, O., was presented with a 30-year-service watch by John L. Collyer, board chairman, The B. F. Goodrich Co.

Emanuel Bleeck has joined Western Insulated Wire Co., Los Angeles, Calif., as chief chemist.

Clois R. Morton has been named production supervisor of the phosgenation department of the New Martinsville, W. Va., plant of Mobay Chemical Co., St. Louis, Mo.

Claud Brown, treasurer of Interchemical Corp., New York, N. Y., has been elected a vice president of the company.

James Forrestal, vice president and a director of General Aniline & Film Corp., New York, N. Y., has been appointed to the staff of the company president, John Hilldring.

E. Wm. Eipper has been named director of the market development department of Stauffer Chemical Co., New York, N. Y., and will continue his headquarters at the firm's San Francisco office.

William D. Gohr has been named manufacturers sales manager of The Firestone Tire & Rubber Co., Akron, O. He has been associated with the company for 32 years.

News Briefs

American Cyanamid Co., New York, N. Y., has turned over its Gloucester City, N. J., titanium dioxide pigments plant to New Jersey Zinc Co., New York, N. Y., fulfilling a joint agreement signed in March, 1954. Cyanamid recently completed the construction of a titanium dioxide pigment plant at Savannah, Ga.

Martin Rubber Co., Inc., Long Branch, N. J., has acquired additional warehouse facilities adjoining its plant.

Stillman Rubber Co., Culver City, Calif., has acquired Plasticast, Inc., San Fernando, Calif., a specialist in polyvinyl dipping and coating, injection molding of plastisols, and other processes. It will operate as the Plasticast Division of Stillman Rubber Co.

M. W. Kellogg Co., New York, N. Y., has reduced the price of its Kel-F Elastomer to $15/$16 a pound, a more-than-30% drop.

The Goodyear Tire & Rubber Co., Akron, O., has received its third General Federation of Women's Clubs Award for its sponsorship of radio's "The Greatest Story Ever Told."

U B S Chemical Corp., Cambridge, Mass., is completing construction of a new plant at Mauldin, S. C.

Vegetable Oil Products Co., Los Angeles, Calif., has completed a $1,000,000 expansion of its fatty acid plant. Its stearic acid and glycerine are distributed to the rubber industry by B. E. Dougherty Co.

The Manufacturing Chemists' Association has revealed that lost-time accidents in the chemical industry during 1955 amounted to 3.25 per million man-hours worked, the lowest accident frequency figure in the history of the industry.

Westvaco Mineral Products Division, Food Machinery & Chemical Corp., New York, N. Y., will begin commercial production at its Newark, Calif., plant of 1707 Catalyst, used in the manufacture of butadiene and styrene. The product is a metal oxide type of dehydrogenation catalyst containing a high proportion of magnesia.

I. B. Kleinert Rubber Co., New York, N. Y., held its annual Infant's Wear Luncheon June 6 at the Hotel Sheraton-Astor, New York, N. Y., attended by 1,000 merchandise managers and buyers.

Whittaker, Clark & Daniels, Inc., New York, N. Y., is consulting with Ronald F. Mawrey, recently arrived special technical representative of Reckitt & Colman (Overseas), Ltd., of England, whose Ultramarine Blues, Whittaker is exclusively distributing in the United States.

The Dayton Rubber Co., automotive wholesale division, Dayton, O., is offering auto supply distributors a compact display of replacement V-belts for power mowers containing 25 belts that cover most of the replacement needs in the field.

Latex & Rubber, Inc., Baltimore, Md., is importing in bulk a new type of latex, "Soctex Type 'CD' Centrifuged Latex," a low ammonia latex with an ammonia content, based on total weight, of about 0.15%.

Monsanto Chemicals, Ltd., Newport, England, will soon begin operations at its 4,000-ton-a-year synthetic rubber plant, built at a cost of $1,500,000.

The Firestone Tire & Rubber Co., Akron, O., is making available for passenger-car sales its Super Sports 170 tire, a nylon cord racing-car tire.

Rhodia, Inc., New York, N. Y., has appointed Klenzade Products Co., Beloit, Wis., sales agent for its Alamask reodorants in the Central states.

United States Rubber Co., New York, N. Y., has announced price reductions up to 10% on its Koylon foam products sold to furniture and bedding manufacturers.

Borg-Warner Corp., Chicago, Ill., has acquired the assets of Industrial Crane & Hoist Corp., Chicago, materials handling equipment manufacturer.

Martin Rubber Co., Long Branch, N. J., has considerably broadened its line of rubber houseware items.

The Goodyear Tire & Rubber Co., Akron, O., will construct additional facilities at its Topeka, Kan., tire plant for the production of white sidewall tires, retread rubber, and more earthmover tires.

Sidney Pinhasik has joined the laboratory staff of the Resinous-Reslac department of Borden Co., chemical division, New York, N. Y.

Financial

American Hard Rubber Co., New York, N. Y. Twelve weeks ended March 25, 1956: net profit, $399,184, equal to $1.28 a share, contrasted with $133,129, or 37¢ a share, in the corresponding period last year.

American Zinc Lead & Smelting Co., Columbus, O., and wholly owned subsidiaries. First quarter, 1956: net profit, $689,969, equal to 59¢ a common share, compared with $508,745, or 43¢ a share, a year ago; sales, $18,776,705, against $18,792,778.

American Viscose Corp., Philadelphia, Pa. March quarter, 1956: net profit, $6,473,000, equal to $1.27 a common share, against $5,930,000, or $1.11 a share, in the 1955 months; net sales, $68,576,000, against $66,418,000.

Armstrong Rubber Co., West Haven, Conn., and wholly owned subsidiaries. Six months ended April 1, 1956: net profit, $854,869, equal to $1.46 a common share, compared with $975,100, or $1.63 a share, a year earlier; net sales, $28,906,239, against $29,851,072; flood loss (net), $80,239, against $0.

Belden Mfg. Co., Chicago, Ill. March quarter, 1956: net earnings, $481,148, equal to $1.24 a share, compared with $286,247, or 74¢ a share, a year earlier.

Sidney Blumenthal & Co., New York, N. Y. January 1-March 31, 1956: net income, $145,598, equal to 41¢ a share, contrasted with net loss of $192,318 in the like period last year.

Brunswick-Balke-Collender Co., Chicago, Ill. Three months to March 31, 1956: net loss, $107,105, against net loss of $373,845 in last year's quarter.

Canada Wire & Cable Co., Ltd., Leaside, Toronto, Ont., Canada. For 1955: net profit, $2,037,019, equal to $9.88 a Class B share, contrasted with $1,344,413, or $6.52 a share, in 1954.

Canadian General Electric Co., Ltd., Toronto, Ont., Canada. For 1955: net earnings, $6,077,267, equal to $31.84 a share, compared with $7,139,759, or $37.46 a share, the year before.

Carborundum Co., Niagara Falls, N. Y. Three months to March 31, 1956: net income, $1,611,685, equal to 94¢ a share against $1,383,161, or 80¢ a share, in the 1955 quarter.

Borg-Warner Corp., Chicago, Ill., and subsidiaries. Initial quarter, 1956: net income, $8,652,713, equal to $1.08 each on 7,880,524 common shares, against $9,555,493, or $1.21 each on 7,786,524 shares, in the 1955 period: net sales, $136,511,981, against $146,157,604.

Celanese Corp. of America, Charlotte, N. C. First three months, 1956: net profit, $3,461,766, equal to 39¢ a share, against $3,911,314, or 47¢ a share, in the like period last year.

Collins & Aikman Corp., New York, N. Y. Year ended February 25, 1956: net profit, $981,361, equal to $1.75 a share, contrasted with net loss of $267,347 in the preceding fiscal year.

Columbian Carbon Co., New York, N. Y. March quarter, 1956: net income, $1,761,453, equal to $1.09 a share, against $1,661,266, or $1.03 a share, a year earlier.

Cooper Tire & Rubber Co., Findlay, O. Quarter ended March 31, 1956: net earnings, $108,527, equal to 69¢ a share, compared with $65,077, or 42¢ a share, in the 1955 quarter.

Crown Cork & Seal Co. Inc., Baltimore, Md. Year ended December 31, 1955: net profit, $1,824,038, equal to $1.05 each on 1,207,790 common shares, against $1,415,695, or 72¢ a share, in 1954; net sales, $112,953,722, against $110,064,190.

Quarter ended March 31, 1956: net earnings, $54,431, equal to 20¢ a share, contrasted with $109,213, or 40¢ a share, in the same quarter of 1955; net sales, $27,504,095, against $26,147,557.

DeVilbiss Co., Toledo, O., and wholly owned subsidiary. Three months to March 31, 1956: net income, $334,337, equal to 92¢ each on 362,850 capital shares, compared with $162,176, or 43¢ each on 375,000 shares in last year's period.

Dow Chemical Co., Midland, Mich., and subsidiaries. Nine months ended February 29, 1956: net earnings, $42,622,456, equal to $1.82 a common share, compared with $26,931,398, or $1.17 a share, a year earlier; net sales, $410,891,687, against $336,118,096.

Industrial Rayon Corp., Cleveland, O. First quarter, 1956: net income, $2,594,402, equal to $1.40 a common share, against $2,729,851, or $1.48 a share, in the 1955 quarter; net sales, $19,991,991, against $22,271,303.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., and consolidated subsidiaries. Three months ended March 31, 1956: net income, $94,919,549, equal to $2.03 a common share, against $93,736,360, or $2.00 a share, in the 1955 months; sales, $468,421,876, against $478,879,548.

Flintkote Co., New York, N. Y. Twelve weeks to March 24, 1956: net income, $633,223, equal to 41¢ a share, against $600,127, or 41¢ a share, in the 1955 weeks.

General Cable Corp., New York, N. Y. January 1-March 31, 1956: net income, $2,188,621, equal to 91¢ a share, compared with $1,382,380, or 60¢ a share, in the like months last year.

General Electric Co., Schenectady, N. Y. Three months ended March 31, 1956: net income, $54,962,000, equal to 63¢ a share, against 61¢ a share in the 1955 months; sales, $946,458,000, against $831,014,000.

The General Tire & Rubber Co., Akron, O., and subsidiaries. Quarter ended February 29, 1956: net profit, $2,273, 240, equal to $1.40 a common share, compared with $2,236,310, or $1.47 a share, a year earlier; net sales, $83,523,606, against $63,574,233.

The B. F. Goodrich Co., Akron, O. March quarter, 1956: net income, $10,082,972, equal to $1.14 each on 8,879,186 common shares, against $9,840,528, or $1.12 each on 8,819,766 shares, in the corresponding period last year: net sales, $180,295,218, against $178,619,306.

Goodyear Tire & Rubber Co., Akron, O., and subsidiaries. First three months, 1956: net earnings, $13,418,897, equal to $1.32 each on 10,153,265 capital shares, against $12,028,872, or $1.18 each on 9,106,608 shares, in the 1955 period; net sales, $335,270,436, against $333,286,839.

Hercules Powder Co., Wilmington, Del. Initial quarter, 1956: net earnings, 55¢ a common share, compared with 51¢ a year earlier; sales, $57,362,562, against $53,130,708.

Hewitt-Robins, Inc., Stamford, Conn. Quarter ended March 31, 1956: net income, $291,659, equal to 90¢ each on 302,846 common shares, compared with $270,076, or 88¢ each on 287,051 shares, in the like period last year; net sales, $12,330,697, against $10,515,063.

Imperial Paper & Color Corp., Glen Falls, N. Y. Nine months to March 31, 1956: net earnings, $1,276,127, equal to $2.50 a share, against $884,472, or $1.73 a share, in the 1955 period.

Koppers Co., Inc., Pittsburgh, Pa. Initial quarter, 1956: net profit, $3,681,655, equal to $1.54 a share compared with $1,862,664, or 86¢ a share, in the like period last year.

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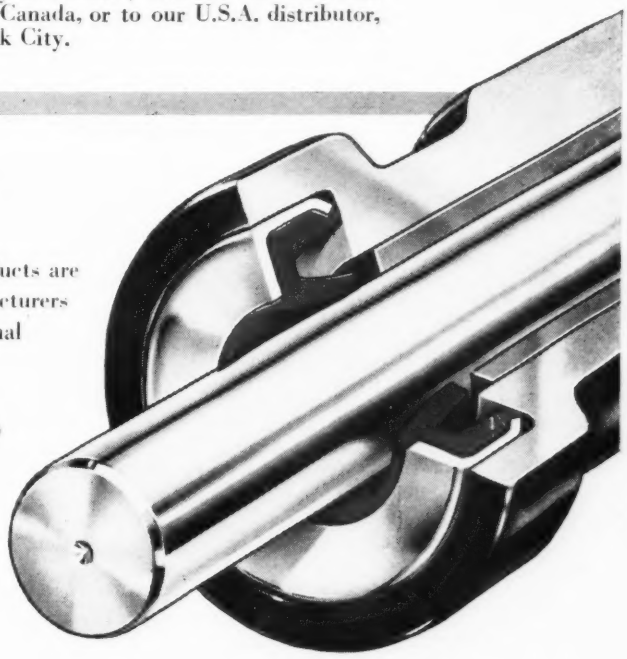
Polysar rubber has improved oil seals—it can improve your products too.



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Hooker Electrochemical Co., Niagara Falls, N. Y. Quarter ended February 29, 1956: consolidated net income, $2,847,100, equal to 46½¢ a common share, compared with $2,357,500, or 38¢ a share, a year earlier; net sales, $23,634,900, against $21,858,200.

Johns-Manville Corp., New York, N. Y., and subsidiaries. Quarter ended March 31, 1956: net profit, $4,110,948, equal to 64¢ each on 6,414,478 capital shares, contrasted with $2,730,699, or 43¢ each on 3,184,237 shares, a year earlier; sales, $64,674,506, against $56,269,622.

Johnson & Johnson, New Brunswick, N. J. First three months, 1956: net earnings, $3,559,000, equal to $1.69 a share, against $3,312,000, or $1.57 a share, in the same quarter last year.

I. B. Kleinert Rubber Co., New York, N. Y., and wholly owned subsidiaries. For 1955: net earnings, $533,057, equal to $1.76 each on 301,616 capital shares, against $434,562, or $1.44 each on 302,192 shares; net sales, $11,718,528, against $10,693,635; income taxes, $543,687, against $480,732.

Liquid Carbonic Corp., Chicago, Ill. Six months ended March 31, 1956: net profit, $847,604, equal to 75¢ each on 1,090,828 common shares, compared with $639,824, or 55¢ each on 939,607 shares, in the corresponding period of 1955; sales, $14,815,521, against $21,599,523.

McNeil Machine & Engineering Co., Akron, O. Year ended December 31, 1955: net profit, $2,435,353, equal to $4.22 a share, against $2,829,148, or $4.90 a share, in 1954; net sales, $23,748,979, against $24,150,591.

Merck & Co., Inc., Rahway, N. J. First quarter, 1956: net earnings, $5,200,000, equal to 49¢ a share, against $3,881,000, or 35¢ a share, a year earlier; sales, $43,600,000, against $38,808,000.

Minnesota Mining & Mfg. Co., St. Paul, Minn., and domestic and Canadian subsidiaries. Three months ended March 31, 1956: net earnings, $8,704,518, equal to $1.04 each on 8,309,816 common shares, against $7,546,170, or 91¢ each on 8,218,985 shares, the year before; net sales, $75,706,190, against $63,382,846.

The New Jersey Zinc Co., New York, N. Y., and subsidiaries. For 1955: net earnings, $4,826,284, equal to $2.46 a share, compared with $3,092,657, or $1.58 a share, in 1954; net sales, $20,408,344, against $14,704,391; federal income taxes, $3,675,000, against $1,426,000; current assets, $29,840,257, current liabilities, $7,847,558, against $30,348,049 and $4,261,067, respectively, on December 31, 1954.

March quarter, 1956: consolidated net earnings, $1,175,475, equal to 60¢ a share, against $1,207,813, or 62¢ a share in the 1955 period; net sales $5,659,414, against $4,849,036.

Monsanto Chemical Co., St. Louis, Mo. March quarter, 1956: net profit, $11,255,291, equal to 54¢ a share, against $14,256,071, or 67¢ a share, a year earlier; net sales, $140,611,232, against $132,767,995.

Mt. Vernon Mills, Inc., New York, N. Y. First quarter, 1956: net profit, $410,000, equal to 63¢ a share, against $267,000, or 41¢ a share, in the 1955 quarter.

National Automotive Fibers, Inc., Trenton, N. J. First quarter, 1956: net income, $258,118, equal to 24¢ a share, contrasted with $985,866, or 90¢ a share, a year earlier.

National Lead Co., New York, N. Y. First quarter, 1956: net earnings, $13,715,511, equal to $1.16 each on 11,375,630 common shares, compared with $10,049,082, or 84¢ each on 11,302,780 shares, in the same quarter last year; sales, $143,326,809, against $119,407,707.

National Rubber Machinery Co., Akron, O. for 1955: net income, $636,249, equal to $3.25 a share, compared with $527,489, or $2.70 a share, in 1954; sales, $11,553,876, against $10,240,700; current assets, $5,193,454, current liabilities, $1,535,688, against $5,244,976 and $1,780,233, respectively, on December 31, 1954.

Nopco Chemical Co., Harrison, N. J., and subsidiaries. January 1-March 31, 1956: net earnings, $358,982, equal to 71¢ each on 492,238 common shares, against $333,709, or 67¢ each on 484,238 shares, a year earlier; sales, $6,417,557, against $5,421,003.

Okonite Corp., Passaic, N. J. Initial quarter, 1956: net earnings, $462,234, equal to $2.41 a share, compared with $251,398, or $1.40 a share, in the like period last year.

O'Sullivan Rubber Corp., Winchester, Va. March quarter, 1956: net income, $10,157, contrasted with $31,678 a year earlier.

Parker Appliance Co., Cleveland, O. Nine months to March 31, 1956: net income, $108,496, equal to 28¢ a share, contrasted with $820,310, or $2.12 a share, a year earlier.

Pennsylvania Salt Mfg. Co., Philadelphia, Pa. Three months ended March 31, 1956: consolidated net income, $895,162, equal to 72¢ each on 1,242,795 capital shares, against $873,648, or 70¢ a share, in the like period last year; sales, $17,256,067, against $15,094,952.

Phelps Dodge Corp., New York, N. Y., and subsidiaries. First quarter, 1956: net earnings, $25,430,339, equal to $2.51 each on 10,142,520 capital shares, compared with $15,177,757, or $1.50 a share, in the corresponding period the year before; sales, $113,540,485, against $78,317,817.

Parke, Davis & Co., Detroit, Mich. First quarter, 1956: net income, $4,196,864, equal to 86¢ a share, compared with $2,832,063, or 58¢ a share, in the 1955 period.

Phillips Petroleum Co., Bartlesville, Okla., and subsidiaries. Three months ended March 31, 1955: net profit, $28,332,238, equal to $1.65 each on 17,150,943 common shares, compared with $22,110,258, or $1.50 each on 14,710,169 shares, in the 1955 months.

Pittsburgh Plate Glass Co., Pittsburgh, Pa. March quarter, 1956: net earnings, $15,704,776, equal to $1.60 a share, against $16,026,948, or $1.63 a share, in last year's quarter.

H. K. Porter Co., Inc., Pittsburgh, Pa. Three months ended March 31, 1956: net earnings, $2,059,251, equal to $1.92 a share, compared with $909,416, or 88¢ a share, in the 1955 months.

Raybestos - Manhattan, Inc., Passaic, N. J., and domestic subsidiaries. Three months ended March 31, 1956: net profit, $1,078,460, equal to $1.72 each on 628,100 capital shares, against $1,006,833, or $1.60 a share, in last year's quarter.

Rome Cable Corp., Rome, N. Y. Year ended March 31, 1956: net income, $2,023,070, equal to $3.82 each on 528,347 common shares, contrasted with $930,879, or $1.81 each on 513,416 shares, in the preceding fiscal year; net sales, $56,996,682, against $39,186,095; federal income taxes, $2,170,000, against $817,006; current assets, $14,430,599, current liabilities, $5,144,259, against $13,107,315 and $3,494,739, respectively, on March 31, 1955.

St. Joseph Lead Co., New York, N. Y. March quarter, 1956: net income, $2,945,748, equal to $1.08 each on 2,716,222 shares, against $3,369,616, or $1.24 a share, in the similar months of 1955; net sales, $29,104,695, against $31,723,474.

Seiberling Rubber Co., Akron, O. First three months, 1956: net earnings, $176,168, equal to 30¢ each on 414,916 common shares, against $133,328, or 21¢ each on 391,430 shares, in the first quarter of 1955; net sales, $10,716,356, against $10,054,459.

Sun Oil Co., Philadelphia, Pa. Three months ended March 31, 1956: net income, $12,255,232, equal to $1.21 each on 10,143,591 shares, against $11,722,108, or $1.23 each on 9,569,129 shares, in the 1955 months.

Timken Roller Bearing Co., Canton, O. First quarter, 1956: net profit, $6,897,998, equal to $2.85 a share, against $4,990,695, or $2.06 a share, in the same months last year.

U. S. Rubber Reclaiming Co., Buffalo, N. Y. First three months, 1956: net profit, $52,293, against $60,573 a year earlier.

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INDUSTRIAL PRODUCTS DEPARTMENT

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Shell Oil Co., New York, N. Y., and wholly owned subsidiaries. Initial quarter, 1956: net profit, $35,010,360, equal to $1.27 each on 27,533,076 capital shares, against $28,584,792, or $1.04 a share, in the same quarter of 1955; sales, $401,626,137, against $353,999,867.

Sheller Mfg. Corp., Portland, Ind., and subsidiaries. Quarter ended March 31, 1955: net earnings, $573,309, equal to 60¢ each on 953,280 capital shares, compared with $880,488, or 92¢ a share, a year earlier; net sales, $12,194,583, against $13,854,475.

Thermoid Co., Trenton, N. J. For 1955: net income, $1,614,343, equal to $1.88 a share, compared with $962,617, or $1.06 a share, in 1954.

March quarter, 1956: net profit, $377,616, or 44¢ a share, against $236,490, or 26¢ a share, in the same months the year before.

Thiokol Chemical Corp., Trenton, N. J. For 1955: net earnings, $536,727, equal to $1.40 each on 383,899 capital shares, compared with $270,776, or 77¢ each on 353,176 shares, in the preceding year; net sales, $13,530,160, against $10,029,190; income taxes, $564,000, against $294,000.

March quarter, 1956: net profit, $156,874, equal to 40¢ on 386,730 shares, against $115,214, or 32¢ each on 355,961 shares, in the like period last year.

Union Asbestos & Rubber Co., Chicago, Ill. For 1955: net loss, $270,813, contrasted with net profit of $336,716 in 1954; net sales, $13,402,136, against $13,649,808; current assets, $6,718,253, current liabilities, $3,163,184, against $7,492,932 and $3,616,760, respectively, on December 31, 1954.

March quarter, 1956: net loss, $85,665, contrasted with net profit of $34,002 in the 1955 quarter; net sales, $3,044,027, against $3,558,030.

Union Carbide & Carbon Corp., New York, N. Y., and subsidiaries. January 1-March 31, 1956: net income, $36,231,322, equal to $1.24 each on 29,224,061 capital shares, compared with $28,397,079, or 98¢ each on 28,952,794 shares, in the first quarter last year; net sales, $309,899,276, against $263,041,109.

United States Rubber Co., New York, N. Y. Initial quarter, 1956: net profit, $9,103,348, equal to $1.44 a common share, compared with $9,940,276, or $1.63 a share, in the 1955 period; net sales, $229,649,654, against $225,161,081.

Westinghouse Air Brake Co., Wilmerding, Pa. March quarter, 1956: net profit, $2,532,698, equal to 61¢ a share, against $1,509,239, or 36¢ a share, a year earlier.

Westinghouse Electric Corp., Pittsburgh, Pa. Quarter ended March 31, 1956: net loss, $18,575,000, contrasted with net profit of $12,782,000 the year before.

United Carbon Co., Charleston, W. Va. Three months to March 31, 1956: net earnings, $1,558,518, equal to $1.31 each on 1,193,655 capital shares, against $1,269,614, or $1.06 a share, in the preceding year's period; net sales, $16,952,000, against $10,091,883.

The Wooster Rubber Co., Wooster, O. Six months ended March 31, 1956: net profit $678,659, equal to 63¢ a common share; net sales, $10,078,885.

West Virginia Pulp & Paper Co., Charleston A, S. C. Six months to April 30, 1956: net earnings, $9,129,000, equal to $1.79 a share, compared with $6,254,000, or $1.22 a share, a year earlier; net sales $95,555,000, against $84,538,000.

S. S. White Dental Mfg. Co., Philadelphia, Pa. Quarter ended March 31, 1956: net income, $202,980, equal to 55¢ a share, compared with $143,057, or 39¢ a share, a year earlier.

Obituaries

William E. Ireland

William E. Ireland, vice president of sales and a director of B. F. Goodrich Co. of Canada, Ltd., a division of The B. F. Goodrich Co., Akron, O., died on May 21 at his home in Kitchener, Ont., Canada. He was graduated from Ohio Wesleyan University in 1931 with a degree in business administration and joined the associated tire sales department of Goodrich three years later.

After serving in various staff and field sales positions with the company, Mr. Ireland was loaned to the government in 1942 as director of tire sales to the Army, Navy, and Lend Lease. The following year he was named chief of the War Production Board's tire production division. In 1945 he returned to Goodrich as manager of replacement passenger-car tire sales.

In 1947, Mr. Ireland was appointed merchandise manager of International B. F. Goodrich Co. and two years later became vice president and general manager of tire sales for that division. He was made vice president and general manager of tire sales of Goodrich in Canada in 1950, and four years afterward was named to the position he held until his death.

The deceased was born in Washington Court House, O., on November 30, 1909.

Mr. Ireland is survived by his wife and three children.

J. G. Milligan

J. G. Milligan, president of J. G. Milligan & Co., Milwaukee, Wis., died suddenly at his home in Miami Beach, Fla., April 8. He was 63.

Born in Milwaukee, Mr. Milligan spent his youth in St. Paul, Minn., before returning to Milwaukee to found the company that bears his name.

He held memberships in Braden Masonic Lodge 168, F.&A.M., at St. Paul; the Wisconsin Consistory; Tripoli Shrine; the Milwaukee Athletic Club; Blue Mound Country Club; LaGorce Golf & Country Club, Miami Beach; and the Leather & Allied Trades Association.

He is survived by his wife, a son, a daughter, and a grandson.

Cody Ressegger

Cody Ressegger, plant manager of Swan Rubber Co., Bucyrus, O., died April 24 of cancer.

Mr. Ressegger joined Swan in 1930 as plant manager and served in that capacity until his death. Previously he had been associated with Miller Rubber Co., The Goodyear Tire & Rubber Co., and The Firestone Tire & Rubber Co. His service to the rubber industry totaled 45 years.

He was born in Green District, Wetzel County, W. Va., on December 6, 1893.

Mr. Ressegger is survived by his wife and son.

Services were held in Bucyrus on April 26, and burial took place in Oakwood Cemetery there.

Robert L. Randall

Robert L. Randall, chief chemist for Midwest Rubber Reclaiming Co., East St. Louis, Ill., died May 28 after a long illness.

Mr. Randall was graduated from Washington University in 1933 with a degree in chemical engineering. The following year he joined Midwest Rubber Reclaiming as a chemist. He was appointed chief chemist in 1938.

He was a member of the American Chemical Society and served on various committees of the Rubber Reclaimers Association. Author and co-author of many papers and articles on rubber reclaiming technology, he held several patents in the field.

The deceased was born in St. Louis, Mo. January 5, 1911.

He is survived by his wife, a daughter, his mother, and a brother.

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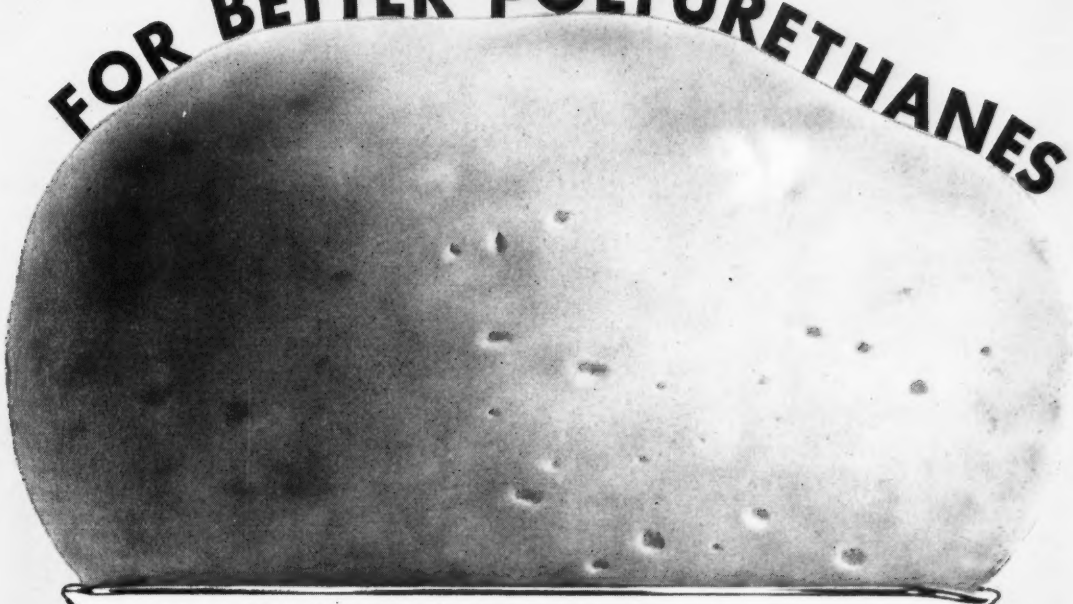

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News from Abroad

Around the Rubber World

By L. Thakar

(This second of a series of three on-the-spot reports on the rubber industry in the Far East by RW's foreign news editor covers the Malayan scene. The final article will survey Japan.)

SINGAPORE, Singapore. My ship, *Flying Enterprise II*, docked in Singapore on April 18. The agenda of my week's stay in the area called for three or four days in Singapore and the remainder in Kuala Lumpur and Kluang, the most populous cities in the Malayan Federation.

Singapore Rubber Goods

In Singapore I was briefed on the status of the rubber manufacturing industry there. Of Singapore's 29 rubber goods plants only four are of any considerable size. Two of these are run by Chinese: Wilkinson Process Co. and Bata Co. The industry consumes 350-450 tons of rubber annually; the chief product is retread compounds for the 84 retreading plants here. About 10 million pairs of rubber footwear are produced each year, although the plants have a rated capacity of 16 million. Mechanical rubber goods for the many tin mines in Malaya are next in importance. Foam rubber manufacture is just coming into its own and will get a big boost from Dunlop's new 500,000-pound plant in Bahau, in the state of Negri Sembilan.

My first visit was to the local Bata sales organization, where the manager, A. Jugas, told me that the firm's factory in Klang, near Kuala Lumpur, makes two million pairs of shoes annually. A 20% expansion is being planned.

My guides next took me to Dunlop's godown, the largest in the Crown Colony, where Chinese women were inspecting, grading, and packing lower grades of rubber for shipment to the company's factories in England. The sheets were being folded and compressed into 70-pound bales, then wrapped in sheet of the same quality, sealed by punching along the joins, talced, and marked. Everything was done by hand.

The next day L. Best, technical director of Fred Waterhouse Co., served as guide for a tour through a latex-producing plant and foam rubber manufacturing plant. I saw the latex being prepared for concentration by creaming with an alginate, and in another section, latex compounds poured into molds for the manufacture of mattresses and cushions, pulled off, and stacked. Again the workers were women. I asked about this and was told jocularly that they were preferred to men because they caused less trouble.

Rubber Research Institute

After interviewing several other producers and consumers in Singapore, I flew to Kuala Lumpur for a scheduled visit at the Rubber Research Institute. The Institute is surrounded by experimental rubber plantations where data on clean-weeding, selective weeding, cover crops, and spacing of trees are being compiled.

At the Institute I met a Mr. Wren and began our discussion with a question on the progress of T.C. rubber. In Singapore I had asked people why the production of T.C. was not being increased, despite the apparent rise in demand. Among the answers I received were these: the seller's market is unenthusiastic; T.C. is useful only to smaller companies who do not have their own technologists; the RRI presently does not have an officer in charge of T.C.; and the larger firms see no point to T.C. unless all rubber is technically classified.

I repeated these explanations to Mr. Wren, who agreed the big manufacturers are not showing interest. He said some estates are not producing T.C. rubber because the chief demand is for the yellow grade, and the red and blue grades are difficult to dispose of. T.C. is also being shunned by the smallholder because the packer with whom he dealt could not afford the expense of classification.

To my query about the progress of the new Superior Processing Rubber which extrudes very well and swells less than conventional natural rubber, Mr. Wren replied that so far only one British manufacturer had bought some of the 50 tons of SPR produced within the last few months. Restricting factor is apparently the high price.

What about new developments, I asked. Mr. Wren said there are several, the most promising of which is rubber-lignin in 50/50 ratio. The soft type has high modulus, good aging properties, good tear resistance, high resilience, and low heat buildup, but is somewhat limited in application because of its not-too-good abrasion resistance. It is hoped the material will find use in automobile sidewalls and inner plies for tires since lignin is cheap, and the price of the rubber compound would be comparatively low. A hard type of rubber-lignin is also being made, and its application in the manufacture of shoe soles seems promising.

NK Production

I learned much about the statistical side of the Malayan rubber industry later that day when I had lunch with the board chairman of one of the large plantation companies. He did not agree with the opinion held by several of his colleagues to whom I had spoken that natural rubber production in the area would not increase during the next five years because the anticipated large-scale replanting of estates would reduce the output of many plantations.

He said production would increase if plantation workers were granted wage boosts, even less than those for which they are now so vigorously agitating. Higher wages would force estate owners and smallholders to put off replanting. The government offer of a grant of $400 for each acre replanted is only about half the cost of this work. Even if large-scale replanting does take place, the higher yields from so-called slaughter-tapping of the trees that must be cut down would make up for the lower output later on.

Planters' Meeting

Next day an air-conditioned coach took me 110 miles down the Malayan Peninsula to Kluang in the State of Jehore. The North Jehore Planters' Association, a branch of the Incorporated Society of Planters, was meeting, and I had been invited. Like so many Americans in foreign parts I was subjected to a barrage of leading questions couched in polite phrases.

Why doesn't the United States agree to buy Malayan rubber at 90 Straits cents a pound over the next five years if it so strongly wanted price stability in the area? Why, if we wanted to keep down Communism in Malaya, do we try to maintain low prices for natural rubber, thus creating unemployment, low wages, and dissatisfaction among the people?

To the first I replied that international agreements had a way of failing; that 90 cents might look like a fair price today, but might prove too high or too low during the next five years.

A pat answer to the second was more difficult since it seemed to me to be an irrational question. Anyway, I replied that if a man became a Communist because a gun was held to his head there was little we could do about it.

RMA Specifications

I returned to Singapore to find out how shippers viewed RMA specifications. I learned that the big firms are doing their best to live up to them, not so all of the smaller ones. Lower-grade rubber was often being blended into bales of higher grades, by some of the smaller packers. When this practice is detected, a substantial markdown in price results, however, which works to the packer's disadvantage.

The view was pretty general that there is little likelihood of real improvement in the situation as long as the market favored sellers. One man told me that no matter what progress is made in the higher grades, #4 and #5 specifications are not likely to be observed. He added that altogether too much RSS#1 is being produced.

Russians Check Full Cargo

Almost 17,000 bales of rubber destined for Vladivostok were hand-checked for quality and packaging in Singapore harbor

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by crewmen of the 3,916-ton Russian freighter *Petropavolovsk Kamchatsky*. The unprecedented action, begun April 19, took more than a week to complete.

An agreement between Malayan shippers and the Soviet Government provides for a 10% weight and quality survey of the total cargo leaving Singapore. The Russian crew, however, was under orders to check every bale of the 2,500-ton cargo before allowing it to be loaded.

It was more than a perfunctory check, observers reported. Loosely packed bales and those with blurred markings were rejected. Shippers were compelled to correct these imperfections before they would be loaded. Crewmen and tally clerks were often at odds about bale counts. Work in the entire harbor was slowed by the bale-by-bale check.

Slowdown Decreed by Union As Wage Parleys Collapse

The National Union of Plantation Workers called upon the 250,000 estate workers it represents to slow down plantation output as the May 10 deadline for settlement of its wage demands passed. The slowdown, conceded by both sides to be a prelude to a general strike, consists of total stoppage of work on Fridays and on days on which it has rained.

A curtain-raiser to the semi-strike took place five days before, on May 5, when thousands of estate workers on several estates refused to accept their pay. The "wage boycott" caught plantation managers by surprise. It was apparently intended to influence the outcome of last-minute talks scheduled between the NUPW and the Malayan Planting Industries Employment Association.

The *Malay Mail* reported that an MPIEA spokesman had said the boycott was mostly confined to Indian laborers, with Chinese workers generally accepting their pay. Officials of the Government's Labor Department commented that it was not an offense for an employe to refuse his wages.

In effect, the Union is calling for the abrogation of the MPIEA policy tying wages to the price of natural rubber. Based on the lower rubber price covering the April-June period, the MPIEA has offered a daily wage of $3.35 for contract tappers, $2.85 for checkroll tappers, and $2.30 for field workers.

Declaring that these wages would no longer supply workers with an adequate standard of living, union officials have remained adamant in their demands for a wage rate of $6, $5.25 and $4.50 for the three categories of estate workers.

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India

Peak Consumption in 1955

Rubber consumption in India during 1955 reached a record high of 27,543 tons, 8% above the previous year's total, Cecil Stack, chairman of the Association of Rubber Manufacturers in India, reported at the Association's annual meeting in April.

Realizing the country's increasing need of the raw material, the Indian Government is currently exploring the possibility of building a synthetic rubber plant, its first, Mr. Stack said. A long-range plan to replant 70,000 acres of rubber in South India has already been drawn up, but the new acreage is not expected to reach its maximum output until 1973.

The ARMI also heard a report by one of its committees which estimated that India's raw rubber requirements would reach 40,000 tons by 1960.

Consider Plans to Increase Natural, Synthetic Supplies

In the past few years Indian production of natural rubber has fallen behind demand by the rapidly growing domestic rubber manufacturing industry. In 1954 consumption was 25,487 tons; while output was only 21,493 tons, and it is estimated that India will have to import 4,600 tons of rubber in the first half of 1956 to meet the needs of consumers. By 1960 these requirements are expected to reach 40,000 tons a year.

The government has been considering ways of meeting the deficit in home-grown rubber, including a plan to extend the existing rubber acreage by new planting of about 10,000 acres. A recently approved long-term scheme provides for replanting with high-yielding stock 70,800 acres of old rubber at the rate of about 7,000 acres a year for 10 years. It is proposed to grant smallholders 400 rupees and larger estates 300 rupees per acre to help finance replanting; this program is expected to cost the government 22,600,000 rupees.

The carrying out of this program will be part of the greatly extended duties of the newly reconstituted Rubber Board, which will also have to undertake and encourage scientific technical, and economic research for the rubber industry; train students in modern methods of rubber planting; give technical advice to growers; collect statistics; and improve working conditions for plantation labor.

At the same time the government apparently also sees the need of a quicker method of meeting the growing demands of India's rubber manufacturers and is contemplating establishment of a local synthetic rubber factory. Publication of these intentions immediately started a controversy. Those in favor claim there is no way in which natural rubber production can be readily stepped up to meet the rapidly increasing needs of industry; they point out that it would take less time and money to set up and put into operation an establishment with annual output of 10,000 tons of synthetic rubber than to start new plantations to give that amount of rubber. Planters oppose the idea; they insist that before long adequate outputs will be obtainable from new and replanted high-yielding areas and point out that new rubber plantations would have the advantage of providing employment for many more persons than would the synthetic rubber factory.

France

Zinc Enanthate as a Compounding Ingredient

A French firm is producing zinc enanthate: $(C_6H_{13}COO)_2$ Zn, claimed to have properties which should make it a useful compounding ingredient for rubber either as a plasticizer or vulcanization activator.

Zinc enanthate is a white powder, very light, unctuous to the touch, tasteless, and with a slight odor. It has a real density of 1.18; apparent density of 0.18; fusion point, 136-137° C.; zinc content, 20.1%; and it is free from manganese, copper, lead, and iron.

Tests show that it is a very efficient plasticizer for crude rubber; used in the proportion of 3%, it reduces by half the time required to attain a given plasticity; in the proportion of 5%, it can replace all the zinc oxide, stearic acid, and plasticizers called for in most of the classic formulae for mixes. Other claims are that it does not affect aging in the oxygen bomb; when it replaces zinc oxide and fatty acid in a mix, there is no change in tensile strength, elongation is improved, Shore hardness is lowered, bending strength is considerably increased, and abrasion resistance becomes distinctly better.

France to Produce Carbon Black?

There is a possibility that France may begin to produce her own carbon black. A very important source of a natural gas, consisting largely of methane accompanied by 15-20% of hydrogen sulfide, has been discovered in southern France. This type of gas has not hitherto been met with anywhere, not even in America, and since there is no previous experience to fall back on to obtain a corrosion-resistant pipe system, exploitation has been delayed. It is conservatively estimated that annual output could include 70,000 tons of sulfur and 240,000,000 cubic meters of high methane content purified gas. From 100,000 to 150,000 tons of sulfur are imported annually so that the sulfur would be readily disposed of, but new outlets would have to be found for the gas, and it is suggested that as France now uses some 6,000 tons of carbon black annually—all imported from America—one outlet might well be in the manufacture of carbon black.

Latex Clarification

For the study of the effects of clarification on latex, reported by P. Gyss,[1] latex from four different clones was clarified in a Sharples laboratory-size super-centrifugal machine having a cylindrical bowl with a single outlet.

Analyses of the purified latex revealed important changes in composition, chief among which were (1) a reduction of acetone extract, nitrogen, and phosphorus; (2) partial elimination of magnesium and

[1] *Rev. gén. caoutchouc*, 32, 7, 623 (1955).

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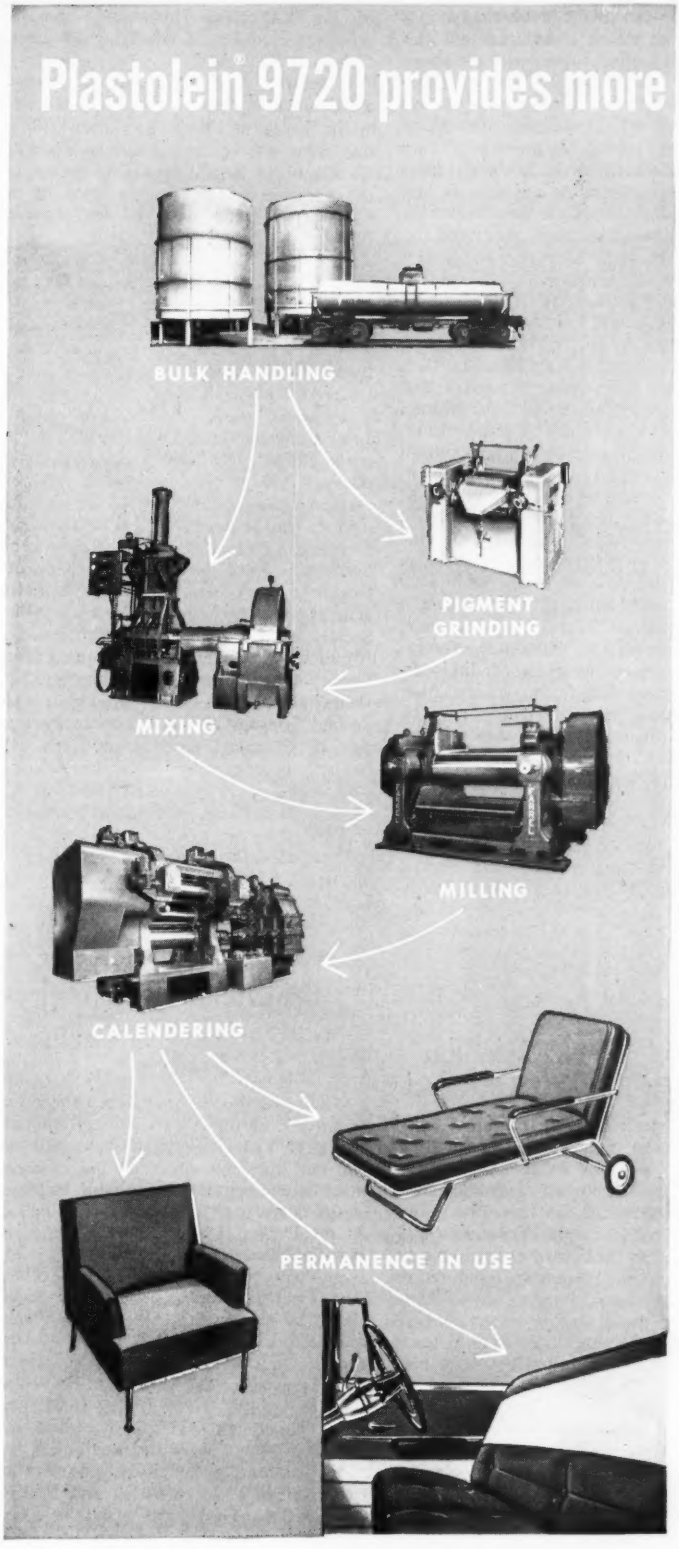

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PERMANENCE: Useful life of finished sheeting, film and coated fabrics is increased 3 to 4 times over monomeric formulations.

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copper; (3) reduction by almost half of the ash content. Since the mechanical stability of concentrated latex has been found to depend upon magnesium content and magnesium/phosphorus ratio, clarification may affect the stability of the latices of some clones. Examination of the chemical composition of rubber obtained by coagulating clarified latex with formic acid showed that while the content of the substances studied is lower than in the unclarified, control samples, the differences are less marked than between the clarified and unclarified latices. However, the relatively reduced acetone extract and nitrogen content of the clarified rubbers would affect curing characteristics.

Clarification influenced the physical properties of the rubber, and modulus was sometimes higher; scorching time was increased, and processability improved. A particularly interesting effect observed was that daily variation in strain and Mooney values of clarified latex from a given clone was generally lower than for the control sample. If similar results were obtainable on an industrial scale of clarification, a strong argument in favor of the process would be provided.

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Germany

Thiuram Vulcanization of Natural Rubber

At the Rubber Institute of the Hannover Technical Institute, W. Scheele and G. Bielstein[1] continued investigations on the vulcanization of highly elastic polymers. In earlier work the value of similar experiments on the reaction of low molecular model compounds for such investigations had been shown, when it was found that both quantitatively and qualitatively thiuram disulfides reacted with geraniol (3,7-dimethyl-2,6-octadien-1-ol) in the absence of oxygen as with natural rubber.

Independently of temperature, 66 mol% of the thiuram disulfide was again converted to the corresponding dithiocarbamic acid, which—under the conditions of vulcanization—in turn was transformed by the ZnO into stable zinc dithiocarbamate. Both the decrease in the concentration of thiuram disulfide and the formation of zinc dithiocarbamate proved to be reactions of the first order, and again the former reaction was the more rapid.

In the latest work the authors report results on vulcanization of natural rubber with tetramethyl thiuram monosulfide and sulfur; the proportion was one mol of the former to one gram atom of sulfur. All tests were carried out in the presence of excess ZnO, and the vulcanization of the rubber (pale crepe) was studied in the temperature range of 90 to 150° C. It was found that during vulcanization there is a decrease in concentration of thiuram monosulfide and with it also of sulfur.

As in vulcanization with thiuram disulfide, after a first-order reaction, about 66 mol % of zinc dithiocarbamate is formed. From this it is deduced that vulcanization of natural rubber with the above ingredients is nothing else but vulcanization by thiuram disulfide, the quantitative formation of which precedes the actual vulcanization reaction. At no stage of cure could thiuram disulfide be positively identified in the vulanization extracts so that it is assumed that it reacts instantaneously with the rubber after it is generated.

In discussing the chemistry of thiuram vulcanization the authors examined the fairly recent studies on the subject by D. Craig and others[2] which they consider lacking in clarity and the concepts therefore rather difficult to understand. They deduce from this work, however, that Craig and others assume that thiuram vulcanization is essentially sulfur vulcanization—a view they do not share. Thiuram vulcanization, as Craig and other see it, they state, postulates the formation of hydrogen sulfide during the direct reaction of thiuram disulfide with alpha methylene groups of the polyisoprene chain molecule. In the presence of ZnO the concentration of H_2S is small, but adequate to cause a noticeable reaction with thiuram disulfide.

The German authors find that the formation of such large amounts of dithiocarbamate (66 mol %) during vulcanization in the presence of ZnO can hardly be ascribed to a reaction of H_2S with thiuram disulfide, even if the formation of H_2S were proved. They find no experimental indication making the formation of H_2S probable, and in their opinion there is no occasion to assume it. Instead they offer for consideration the suggestion that a polymerization of the polyisoprene by disulfide radicals takes place in which the double bonds as well as alpha methylene groups are attacked by the radicals.

[1] *Kautschuk u. Gummi*, 8, 10, 251 WT (1955).

[2] *J. Polymer Sci.*, V, 709 (1950); VI, 1, 7, 13, 177 (1951); VIII, 321 (1952).

EFCE 1956-58 Calendar Of Conferences Revealed

The European Federation of Chemical Engineering, an organization consisting of 24 member societies from 13 European countries, has announced its calendar of technical conferences for 1956-58.

Founded in 1953, the Federation primarily concerns itself with encouraging its member societies to organize conferences in their own names. It holds, however, a Congress of the European Federation of Chemical Engineering under its own name every three years. The first of these, held last year in Frankfurt-a.M., drew more than 12,000 visitors from 53 countries.

The following events will be sponsored during the next three years, some scheduled tentatively

June 7-8, 1956, Frankfurt-a.M. Thirty-first Annual Congress of the Dechema (Deutsche Gesellschaft fur Chemisches Apparatewesen). The subject of this meeting will be "The Basic Principles of Chemical Engineering as Applied to Chemical Reactions on a Large Scale."

October 1-3, 1956, Hamburg. Annual Meeting of Process Engineers. This will be organized by the Process Engineering Section of the V.D.I., Frankfurt-a.M.; the Plant & Equipment Construction Section of the V.D.M.A., Dusseldorf; and the Society for Process Engineering Research, Cologne.

November 22-24, 1956, Paris, France. Symposium on Special Themes. Organized by the Societe de Chimie Industrielle, Paris, this event will be held in connection with the Chemical Engineering Convention on the occasion of the fourth Salon de la Chimie, du Caoutchouc et des Matieres Plastiques.

Spring, 1957, The Hague, The Netherlands. Symposium on a Special Theme. This will be organized jointly by the Koninkijk Instituut van Ingenieurs (Royal Society of Engineers) and Koninkijk Nederlandse Chemische Vereniging (Royal Dutch Chemical Society).

Autumn, 1957, Zurich, Switzerland. Joint Congress on a Theme. This conference, the details of which have yet to be planned, will be organized by the Schweizerischen Gesellschaft fur Chemische Industrie (Swiss Society for Chemical Engineering & Industry), the Schweizerischen Chemiker Verband (Society of Swiss Chemists), and the Schweizerischen Ingenieur & Architekten Verein (Swiss Society of Engineers and Architects). Ingenieur & Architekten Verein (Swiss Society of Engineers and Architects).

May 31-June 8, 1958, Frankfurt-a.M. Second Congress of the European Federation of Chemical Engineering. This will be held in connection with the Achema Chemical Apparatus and Equipment Congress and Exhibition, which will take place in Frankfurt.

Detailed information on these conferences can be obtained from their organizing societies.

Oil-Extended Natural Rubber Compounding Studies

Natural rubber, like synthetic rubber, can be extended with relatively large amounts of Naftolen ZD, a petroleum-base material, but the softening effect of the extender must be compensated by suitable increases in the quantity of reinforcing filler added. At the Colloid Chemical Laboratories of Metallgesellschaft A.G., Frankfurt a.M., experiments were conducted with oil-extended natural rubbers with special reference to the effect of the filler, and results are discussed by O. Enslin.[1] Tests were carried out on rubber mixes containing 42% by weight of CK3 carbon black and from 5% to 30% of Naftolen ZD; on mixes containing 20% of Naftolen and varying amounts of filler; and finally on mixes containing increasing amounts of both Naftolen (up to 50%) and filler.

In the third series of tests the fillers studied were CK3 and Durex O carbon blacks and the white fillers, Calsil and Ultrasil. No improvement followed the replacement of part of the CK3 by Durex O carbon black in some of the tests.

When the semi-active white filler, Casilicate Calsil, was used instead of carbon black, larger proportions of filler were

[1] *Kautschuk u. Gummi*, 8, 10, 263 WT (1955).

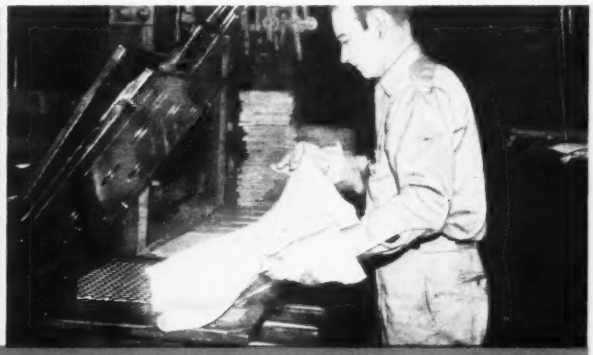
Wooster Rubber Company reduces mold loading weights—with **PLASKON**† Polyethylene Lubricants

Here's how an alert manufacturer of molded rubber products cuts production costs by adding Barrett's new multiple-purpose polyethylene lubricants to Banbury mix.

1. Here in the plant of Wooster Rubber Co., at Wooster, Ohio, PLASKON Polyethylene Lubricant is added at beginning of the mix to improve processibility of milled stocks. Barrett laboratories have proved the effectiveness of polyethylene lubricants as tack and shrinkage modifiers and anti-blooming agents.

2. Rubber stock is cut from rolls, then conveyed to calender. Tests show that PLASKON Lubricants speed milling and aid filler dispersion in all natural and synthetic elastomers, including neoprene and "Hypalon".

3. Milled stock comes from calender ready for molding. Unlike ordinary lubricants, PLASKON Polyethylene Lubricants are completely safe—non-staining, non-discoloring, non-migrating and non-toxic.



4. With PLASKON Polyethylene Lubricant, rubber stock flows evenly into mold cavity. Considerable cost savings have resulted from reduced mold loading weights.

5. Mr. J. R. Andreas, Assistant Purchasing Agent, exhibits "Rubbermaid" products manufactured at the Wooster plant.

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required to maintain 60 Shore hardness of the vulcanizates. Impact elasticity was considerably higher than in CK3 mixes, but tensile strength and notched bar impact strength fell with increased loading; abrasion resistance was very low.

By contrast, unusually interesting results were achieved when the highly active SiO_2 filler, Ultrasil VN3, was used in combination with Naftolen. Though the curve for tensile strength was found to slope steeply downward, it was on the whole high; impact elasticity was high, as in Calsil; the curve for notched bar strength was for the most part almost horizontal and was also high. Abrasion increased with increased filler content, but not to the same extent as with Calsil. The low modulus value was striking, as was the correspondingly high elongation at rupture.

An important point is that 30 parts by weight of Ultrasil is enough to give approximately 60 Shore hardness which can be maintained over the whole series of tests with the addition, as the proportion of Naftolen is increased, of only about half as much Ultrasil as of CK3, if the former were used. A mix containing 50 parts by weight of Naftolen requires 84 parts of CK3, but only 52.5 parts Ultrasil; if the mix with 50 parts of Naftolen is reinforced by both Ultrasil and CK3, then only 22.5 parts of the former and 42 parts of the latter are required, thus leading to a corresponding improvement in several vulcanization properties. Thus these tests show that by suitable choice of fillers it is possible to obtain vulcanizates with good mechanical properties from mixes containing as much as 50% of Naftolen.

Large additions of Naftolen ZD were found to have practically no effect on aging. Incorporation of Naftolen in rubber by coagulating it together with natural latex offered no advantage over the usual procedure of blending on the mill or in internal mixers.

Foam Rubber Mattress Sterilization Practice

The capacity of latex rubber foam to inhibit the development of bacteria and even to kill them was reported on in Germany in 1954 by Theo. Lammers, who observed it in the case of Dunlopillo. In *Kautschuk and Gummi*,[1] K. Heicken, of Robert Koch Institute, Berlin, discusses the same findings on other makes of latex rubber foam. He found that when one gram of foam rubber is introduced into 10 cm^3 of a nutrient broth inoculated with staphylococci, paratyphoid bacilli, or bacterium coli, the bacteria are not only fully inhibited within 24 hours, but are actually killed. The action is most rapid against the first of these bodies and less pronounced against the other two; it was insignificant in the case of *proteus vulgaris* (the common bacillus of putrefaction) and *bacterium pyocyaneus* (green pus bacillus).

Similar results were obtained when the foam rubber was placed into inoculated agar-agar, or when a dilute suspension of the bacteria was very thinly spread on foam latex surfaces, and treatment with water, organic solvent, or steam did not extract the active inhibiting principle of the foam rubber. Aging lessened the effect slowly; a 15-year-old sample was found to have lost 60% of its efficacy.

The situation is different when foam rubber is infected with bacteria in the natural secretions, as mostly occurs in practice; then the bactericidal action of the rubber is considerably reduced, and the usual disinfection measures cannot be ignored. In a series of disinfecting tests conducted on contaminated rubber foam, formalin gave the quickest results and was the most economical to use, though certain precautions are necessary with it.

The English method of disinfecting foam rubber mattresses with cold formalin vapors in sealed cabinets proved satisfactory in tests when secretions were moist, but was ineffectual when they were dry. Thorough disinfection was achieved with the Flugg process based on rapid evaporation of dilute aqueous dispersions of formalin with application of heat. The objection sometimes offered that the mattresses are overheated by this method is not valid, Professor Heicken remarks, since the vapors are almost cooled to room temperature by the time they come down on the material.

[1] 8, 12, 299 (1955).

Prof. Lothar Hock Honored

Last November, Prof. Lothar Hock, well-known German investigator and teacher, celebrated his sixty-fifth birthday; and the Deutsche Kautschuk Gesellschaft took the occasion to honor him for his services on behalf of rubber science and technology, by the award of the Carl-Dietrich-Harries Plaquette of the Society. A number of Professor Hock's former students and Dr. Schmidt, as representative of the WdK (Association of the German Rubber Industry) were in attendance when the presentation was made by Dr. Giese, chairman of the Deutsche Kautschuk Gesellschaft.

New Compression Fatigue Test for Foam Rubber

A new device with which compression fatigue of foamed latex rubber cushioning can be determined has been developed by Kark Frank G.m.b.H., Weinheim-Birkenau. The machine, with which flexing tests according to ASTM D1055-49 Suffix H[1] can be carried out, has the advantage of permitting two samples to be tested at the same time.

The samples are placed between the platens of the apparatus in such a way that the open side of the foam rubber network lies close up against the perforated outside platens so that enclosed air can easily escape at each compression. The outside platens can be adjusted to the thickness of the sample. The central platen is connected with an eccentric drive and has a vertical to-and-fro movement by which the two samples are alternately compressed and relaxed. The stroke can be regulated to 60, 50 or 25% of original thickness, according to the hardness of the material; the rate is 60 strokes a minute, and the number of strokes is indicated on a rotary counter.

Samples of 350 by 350 millimeters can be tested, and results are evaluated visually by comparison with a sample that has not been under load.

[1] "ASTM Standards for Rubber Products," American Society for Testing Materials. 1916 Race St., Philadelphia, Pa.

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Israel

Tire production was started in Israel in 1952 by two companies, General Tire & Rubber Co. (Israel), Ltd., at Petah Tikvah, and Alliance Tire & Rubber Co., Ltd., at Madera. Although of such recent date, the industry has made considerable strides, thanks to American equipment, the aid and training by American specialists, and the rapidity with which the workers were able to adopt American methods. According to recent data,[1] total output came to 115,585 tires and 81,119 tubes in 1953 and rose to 144,820 tires and 108,902 tubes in 1954, and included practically all types except special heavy-duty and airplane tires and metallic wire tires. In 1952 and 1953 practically all these special tires were supplied by the United States, but Germany has meanwhile come to the fore and was the chief source in 1955.

Total domestic consumption of tires in 1953 came to 103,329 units, or 2,944 tons, and included 50,556 truck tires, 10,326 bus, 13,086 taxi, 14,702 passenger, 7,652 motorcycle, and 7,000 special imported tires; the level was practically the same in 1954.

The export trade has developed from a total value of $902,000 in 1953 to $2,305,000 in 1954; the chief customers were Finland, Yugoslavia, Turkey, Iceland, Greece, Belgian Congo and Kenya.

All the raw material has to be imported and in 1954 included 1,250 tons of rubber, 500 tons of carbon black, 599 tons of rayon, 100 tons of steel wire, and 245 tons of chemicals. The quality of these materials must be up to the standards adhered to by the parent companies. Carbon black, rayon, steel wire, zinc oxide, and stearine, are largely imported from Germany against Reparation Funds.

[1] *Rev. gén. caoutchouc*, 32, 9, 758 (1955).

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Indo-China

In view of the considerable increase in the production of centrifuged Latex in Indo-China in the last five years the IRCI (Institute of Rubber Research in Indo-China) in March 1952, began a systematic study of the variability of centrifuged latices and of the effects of centrifuging techniques. The study had already been started when Kidder's work on the

(Continued on page 474)

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Use this Marshall Oven Furnace for high temperature testing your adhesive bonds, cemented and fabricated assemblies, rubber or plastic units, as well as aluminum and magnesium alloy products.

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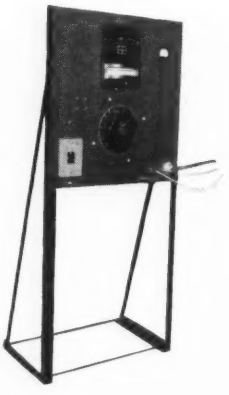
The Marshall Control Panel will enable you to regulate temperature to within close limits. Controls current input and assures temperature uniformity.



Marshall
TESTING PRODUCTS

CALENDAR

June 17-21

American Society of Mechanical Engineers. Semi-Annual Meeting. Hotel Statler, Cleveland, O.
(Rubber & Plastics Division, June 18.)

June 17-22

American Society for Testing Materials. Annual Meeting and Twelfth Exhibit of Testing & Scientific Apparatus & Laboratory Supplies. Chalfonte-Haddon Hall, Atlantic City, N. J.
Committee D-11 on Rubber, June 20-22.)

June 20-21

Division of High-Polymer Physics, APS, and Division of Colloid Chemistry, ACS. Joint Symposium on "Diffusion" and "Flow Processes in Polymers." Madison, Wis.

June 22

Detroit Rubber & Plastics Group. Outing. Western Country Club.

Washington Rubber Group. Annual Outing. Bethesda Country Club, Bethesda, Md.

July 27

Chicago Rubber Group. Golf Outing. Medinah Country Club, Medinah, Ill.

July 30-August 3

Gordon Research Conference of the American Assn. for the Advancement of Science. 1956 Conference on Elastomers. Colby Junior College, New London, N. H.

August 2

New York Rubber Group. Golf Tournament. Innis Arden Golf Club, Old Greenwich, Conn.

August 17

Philadelphia Rubber Group. Outing. Manufacturers Golf & Country Club, Oreland, Pa.

August 26-30

Natl. Assn. of Furniture Mfrs. Supply, Equipment & Fabric Fair. Conrad Hilton Hotel, Chicago, Ill.

September 8

Connecticut Rubber Group. Outing.

September 10-12

American Society of Mechanical Engineers. Fall Meeting. Denver, Colo.

September 19-21

Division of Rubber Chemistry, ACS. Chalfonte-Haddon Hall, Atlantic City, N. J.

October 2

The Los Angeles Rubber Group, Inc. Hotel Statler, Los Angeles, Calif.

Buffalo Rubber Group. Fall Meeting.

October 5

New York Rubber Group. Fall Meeting. Henry Hudson Hotel, New York, N. Y.

Boston Rubber Group. Fall Meeting. Hotel Somerset, Boston, Mass.

NEW MATERIALS

Primary PVC Plasticizer—Santicizer 213

A new primary plasticizer for polyvinyl chloride which is said to reduce greatly the tack of the plastic surfaces has been introduced by Monsanto Chemical Co., organic chemicals division, St. Louis, Mo. Called Santicizer 213, it is said to effect a coefficient of friction in plasticized PVC of 0.5, compared to a coefficient of friction of 1.8 in DOP-plasticized PVC. When properly incorporated in PVC formulations, Santicizer 213 is also said to produce plastisols with low initial viscosities, to enhance fusion characteristics, and to improve the gloss of molded, calendered, and extruded items.

According to the company, Santicizer 213 is compatible with polyvinyl chloride in concentrations up to 100 PHR and can be used with any other primary plasticizer, but it is not recommended for use with extender-type or secondary plasticizers. It is believed to be one of the most rapid fusing primary plasticizers available, superior to DOP in this respect. The use of this plasticizer is suggested in coated cloth, film and sheeting, profile extrusions, rigidsols, plastisols, floor tile, and wire coatings.

Some physical properties of Santicizer 213 have been reported as follows:

Appearance	water-white liquid
Odor	characteristic, very low
Specific gravity @ 24/25° C.	1.0042 (8.34 lbs./gal.)
Viscosity, @ 100° F.	13.22 cks.
210° F.	2.73 cks.
Fire point	330° F.
Flash point	305° F.
Acid value	0.33 meq./100 gms.

Technical Bulletin No. ODB-55-24, describing Santicizer 213 and its compounding with PVC, is available from the company on request.

Pyrolux Maroon D-3148 Pigment

A new organic color pigment for vinyl chloride resins and vinyl copolymers, polystyrene, and polyethylene has been added to the line of Sherwin-Williams Co., pigment, color and chemical division, New York, N. Y. Called Pyrolux Maroon D-3148, it is said to be characterized by brilliance, high heat resistance, excellent permanence, and ease of dispersion. The company recommends it for those plastics where heat resistance is of prime importance and light resistance is often desired. The pigment is resistant to most acids and alkalies and to water, is easily ground, and has a specific gravity of 1.84 and an oil absorption rating of 53.

Sponge Rubber Gasketing Adhesive

A new adhesive for bonding sponge rubber gasketing to painted or baked metal in automotive and refrigeration plants has been placed on the market by Rubba, Inc., New York, N. Y. Called Rubbagrip, it is a synthetic rubber-based elastomeric solvent-type material, light buff in color, and has a viscosity suitable for extrusion through a flow gun or application by brush. Waterproof, oil resistant, and having excellent aging qualities, the adhesive, according to the company, meets the specifications of the automotive industry for cementing weatherstripping. It is fast-setting and is said to withstand the tension created by sharp contours or designs, holding wet lamination in place until set.

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peel off easily from pressure sensitive and tacky surfaces

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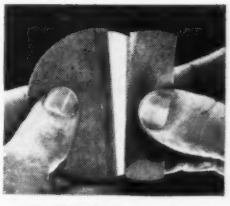
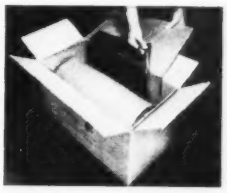


Ideal backing for pressure sensitive surfaces



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Releases readily from pressure sensitive plastics

Correct "releasing" action in almost any situation is provided by new *low cost* Patapar Releasing Parchments. These special types of Patapar Vegetable Parchment excel as a backing material, liner, interleaver, overwrap, separator sheet and many other uses.

Features of Patapar Releasing Parchments include: *dense, fibre free texture; high resistance to penetration or migration of oil and softeners; permanent releasing action.*

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a stable, aqueous dispersion of VISTANEX*. The product is unloaded and yields a colorless, tacky film when the moisture is removed. VISTANEX is widely known for its stability, resistance to aging and chemical inertness. The VISTANEX dispersion is compatible with natural and synthetic latex.

*Trade Mark, Enjay Company, Inc.

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3. Protective coatings
4. Sealing compounds
5. Additive for latex compounding
6. Modifier for dextrine, gums and starches
7. Textile coatings
8. Textile laminating
9. Adhesives for flock printing
10. Binder for cellulose, textile and leather fibers.

SPECIFICATIONS and PROPERTIES

Appearance
Milky white liquid

Solids
55% ± 1.5%

pH
10-11

Specific Gravity
0.97 approximately

Coagulum
0.5 max. retained in 60 mesh

Viscosity
Medium

For complete technical data and sample, send to

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- SOLE and HEEL LACQUERS. Eliminate seconds by using our special pigmented lacquers. Can be supplied in any color desired.
- NCP 1909. An anti-tack coating. Spray or brush it on any tacky surface where powder is normally used to kill tack before cure.
- CASUALS, footwear. NCP 1909 is an excellent dulling and anti-tack agent on edges of soles or crepe wrappers used in the manufacturing of casual type footwear.
- SPECIAL lacquers for all types of rubber products.

Write for complete details

The National Chemical & Plastics Co.
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Low Linoleic White Oleine Groco 5L

A premium oleic acid of extremely light color and low linoleic acid content has been introduced by A. Gross & Co., New York, N. Y. Called Groco 5L, it is said to be highly stable and resistant to oxidation.

Reported specifications of Groco 5L are as follows:

Titre	5° C. max.
Color, 5¼-inch Lovibond Red	1 max.
5¼-inch Lovibond Yellow	10 max.
Gardner 1933	2 max.
Unsaponifiable	1% max.
Saponification value	200-205
Acid value	199-204
Iodine value	86 max.

Non-Staining Chemigum N-6B

A light-colored, non-staining, non-discoloring version of its Chemigum N6, a medium acrylonitrile-content copolymer, has been developed by The Goodyear Tire & Rubber Co., chemical division, Akron, O. Designated Chemigum N-6B, it is said to be applicable for use in such light-colored goods as flooring and clear cements and in applications where resistance to ultraviolet light or photo-chemical degradation is needed. N-6B is a counterpart of Chemigum N6, except that an improved antioxidant system is employed to get its non-staining properties.

Some typical reported properties of Chemigum N-6B follow:

Acrylonitrile content, %	32
Specific gravity	0.98
Mooney plasticity	55
Solubility in MEK, %	82
Polymer, %	97
Antioxidant, %	2

New Heveaplus Developed—MG50

Malayan natural rubber researchers have developed technical graft polymers that contain up to 50% of polymethyl methacrylate, it has been revealed by the Natural Rubber Bureau, Washington, D. C.

Dubbed MG50, the natural rubber compound is said to provide rigid shockproof vulcanizates with B.S.I. hardness in excess of 95 degrees and the high tensile strength of Heveaplus MG, the 23% polymethyl-methacrylate natural-rubber compound first announced several years ago.

Hard molding compositions based on MG50 are sufficiently stiff at molding temperatures to permit stripping or automatic ejection from the hot mold without undue distortion, the Bureau says. The hot vulcanizate is, however, sufficiently deformable to be formed either by vacuum-forming or post-forming techniques.

MG50 is also said to show excellent extrusion characteristics, resulting in tubing that is impact resisting and has good resistance to flexing. MG50, furthermore, can be used as a reinforcing resin in natural rubber, with which it is readily compatible.

Compounding data on MG50 appears in a recent issue of "Rubber Developments," a publication of the Natural Rubber Bureau, 1631 K St., N.W., Washington 6, D. C., which is available on request.

DTBP-Substitute for UCC Silicone Gums

A substitute for di-tertiary-butyl peroxide (DTBP), the recommended catalyst for the curing of its silicone rubbers, has been developed by the silicones division of Union Carbide & Carbon Corp., New York, N. Y. Designated X-1960, the catalyst does not have the highly volatile nature of DTBP, producing little fumes and minimizing the possibility of flash fires, the company says. A stiff white paste with a density of 1.10, X-1960 is composed of W-96 silicone rubber gum, a filler, and 5% DTBP which

(Continued on page 486)

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Our experience with rubber goes back a long way. Over the years we have collected laboratory and plant information of definite value to manufacturers of various types of rubber goods. Call our technical representative and talk over your operations. Practical technical aid is yours for the asking. We will be glad to help you cut your costs and improve your profits.

Phillips 66

CURRENT PHILPRENE RUBBERS

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HOT	PHILPRENE 1000 PHILPRENE 1001 PHILPRENE 1006 PHILPRENE 1009 PHILPRENE 1018 PHILPRENE 1019 NOTE: PHILPRENE 1019 AND 1503 ARE ESPECIALLY DESIGNED FOR THE WIRE AND CABLE INDUSTRY	
COLD	PHILPRENE 1500 PHILPRENE 1502 PHILPRENE 1503	PHILPRENE 1601 PHILPRENE 1605* *Philblack® A cold rubber masterbatch
COLD OIL	PHILPRENE 1703 PHILPRENE 1706 PHILPRENE 1708 PHILPRENE 1712	PHILPRENE 1803 similar to GR-S 1801 but incorporating 25 parts Philrich® 5

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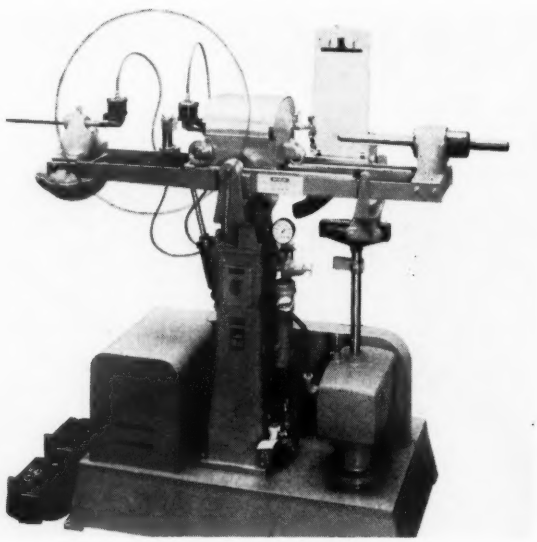
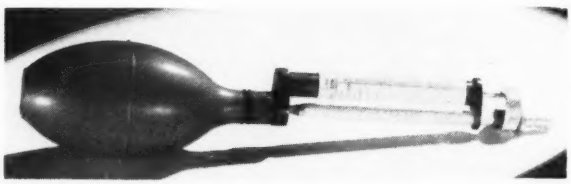


Spruance clamps on IP-4 Tensilgraph

Semi-Automatic Cord-Testing Clamps

Newly designed clamps for its IP-4 Tensilgraph that are said to permit testing of tire cords with improved precision through a semi-automatic method which speeds production testing for quality control have been introduced by Scott Testers, Inc., Providence, R. I. Called Spruance clamps, they are pneumatically actuated, resulting in the following advantages, according to the company: automatic adjustment of clamps compensates for varying cord diameters; uniform pressure upon cord eliminates crushing and slippage; twist is not disturbed; uniform tension and greater precision result.

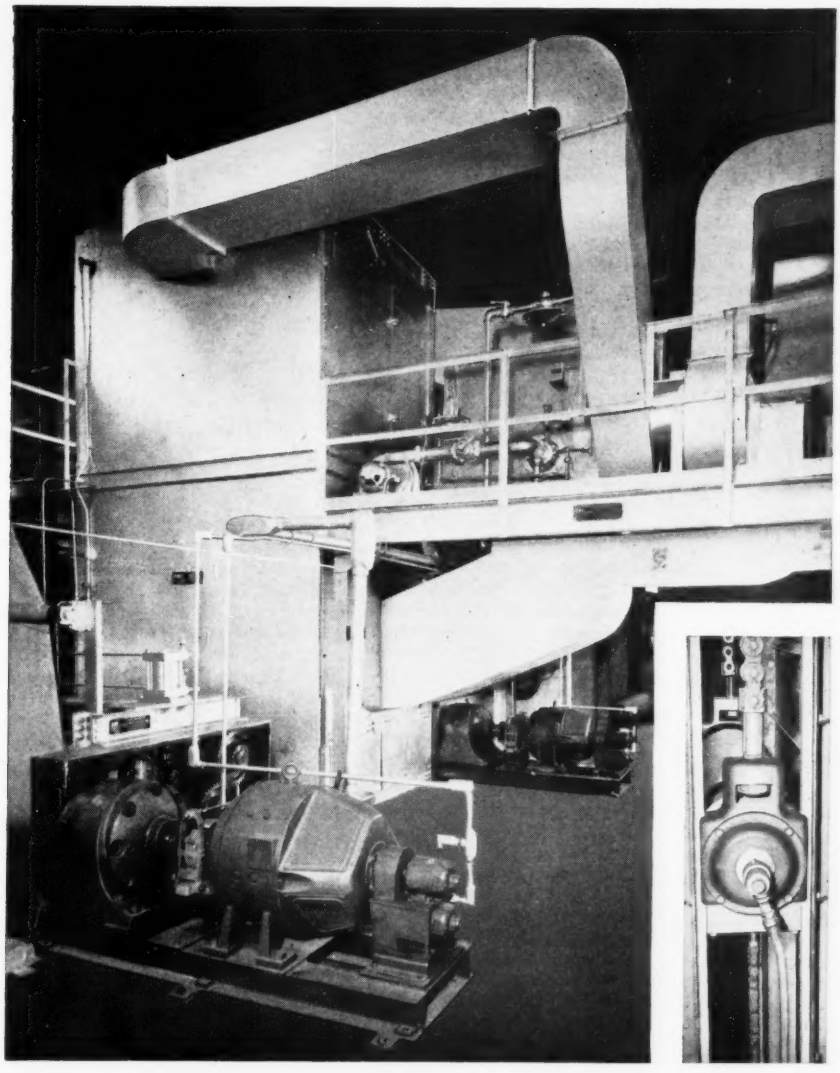
To operate the clamps a foot-switch is pressed, actuating this automatic sequence: fixed clamp closes; specimen is straightened to point of initial tension without strain; moving clamp closes; and test proceeds. After the cord has broken, both clamps open simultaneously, and the broken ends clear away.



MSA hydrogen sulfide detector

Hand-Operated H_2S Detector

An improved hand-operated instrument for the detection of hydrogen sulfide has been placed on the market by Mine Safety Appliances Co., Pittsburgh, Pa. The principal feature of the new instrument is a dual scale to provide accurate readings in percentages by volume or in grains per hundred cubic feet. Range of the instrument is from zero to 25 grains per hundred cubic feet. The percentage graduations enable use of the instrument for detection as low as 0.0025% and up to 0.04% by volume. Concentrations of H_2S above 20 parts per million of air are said to be harmful.



Within the first day of startup, full width nylon tire cord processed in this 30-yard-per-minute, 14,000-pound-tension **IOI** Rollevator® Oven*, was made into aircraft tires meeting all qualification tests.

The Rollevator® roll automatically moves up and down within the oven, in direct relation to line speeds. Thus, at *any line speed, heat-exposure* time of the nylon is held *constant* at a constant temperature setting and at constant tension.

Rollevator® Oven* hot stretches nylon tire cord at constant optimum temperature, constant time and constant tension, at variable line speeds

The IOI Rollevator® Oven* is the answer to more uniform hot stretching of nylon with greater production efficiency. Simple and automatic in operation, it practically eliminates costly shutdown and repair time. When the line is stopped the Rollevator® roll automatically lowers out of the heat zone, eliminating the need for quick cool purging of the oven and the time and expense involved in reheating the oven when starting up again. Its low operating cost combined with low initial cost assures you of lower production cost. An IOI sales engineer will be glad to give you complete information about the Rollevator® Oven* and to discuss your requirements for any system from 3 to 100 yards per minute.

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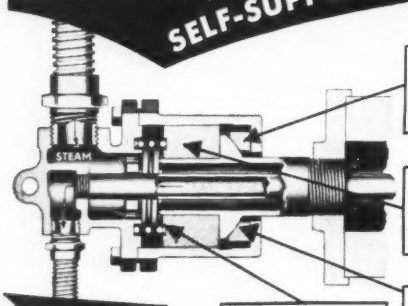

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2. GUIDE — Also of carbon-graphite. Makes joint self-supporting.

3. NIPPLE — Rotates with roll, seals against ring.

4. SPRING — For initial seating only. In operation joint is pressure sealed.

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For introducing steam and liquids into rotating rolls and cylinders, there's nothing like the Johnson Joint above. It's packless, self-lubricating, self-adjusting, self-supporting. It has been adopted by dozens of machinery makers, and is finding new uses every day.

Type SB shown handles both steam and condensate through same head; also available for through flow service, and in sizes and styles for all operating conditions. ***Write for literature.***

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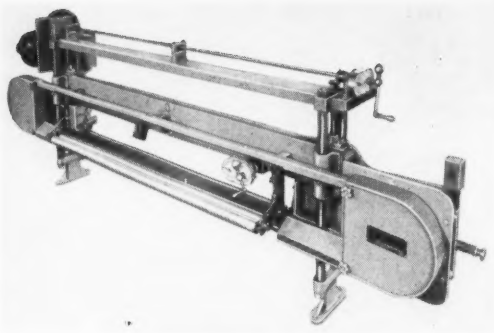
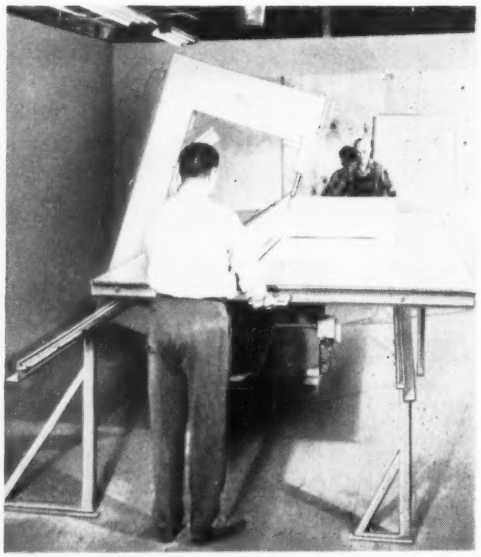


FEMCO splitting head

Vertically Adjustable Splitting Head

A new vertically adjustable splitting head for the slicing of foam rubber, polyvinyl chloride, polyurethane, and similar materials has been placed on the market by Falls Engineering & Machine Co., Cuyahoga Falls, O. Designed to fit existing plant conveyor systems, the splitting head is equipped with a ¾-inch scalloped-edge knife which is driven around two 14-inch semi-steel wheels and is completely guarded except at the cutting edge. An aluminum compression roll holds the stock firmly against the belt as it is being fed into the cutting edge of the knife.

Both roll and blade are adjusted by means of separate micro dial gages. The unit has a maximum vertical adjustment of 12 inches and will split most materials to ⅛-inch. Power equipment to lower or raise the knife automatically is optional. The splitting head is available in widths of 48, 64, 72, and 84 inches. It may be installed as a single unit or in a series along the conveyor line.



Edge foam rubber band machine

Large Foam Rubber Cutting Machine

A new band machine with an enlarged table surface measuring 80 inches by 12 feet 2 inches for cutting foam rubber products, polyurethane foam, resin-bonded fibers, and other materials, has been added to the foam rubber band machine line of Frank Edge Saw Mfg. Co., Grand Rapids, Mich. According to the company, the machine features a truss-supported, large-size movable table surface that is highly varnished and rides with ball-bearing suspension on extended guide runners. The runners are supported by an easily adjusted frame assembly. The machine enables set-up time to be cut to a minimum and many costly jigs eliminated, the company says.

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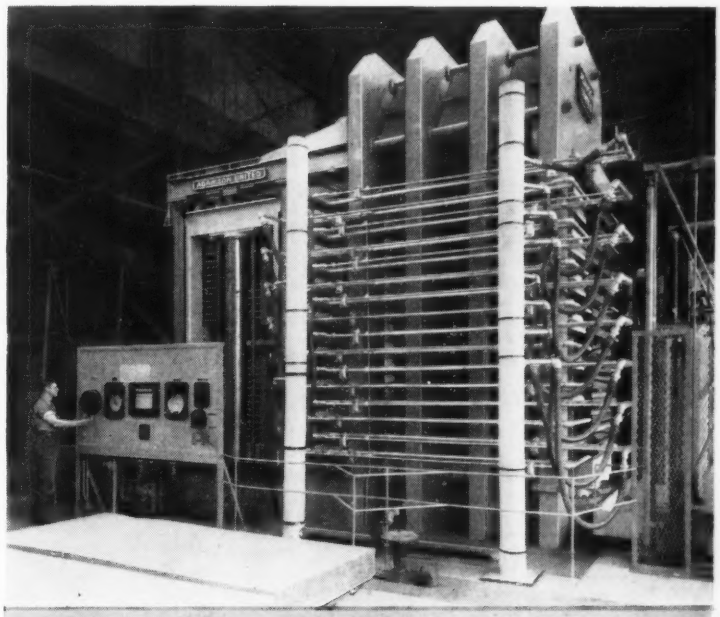
- Closing speeds and automatic cycling meet any requirement, with number and size of openings to suit.



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NEW PRODUCTS

Terra-Tires on Dodge Power Wagon

Goodyear High Flotation Terra-Tire

A barrel-shaped low-pressure pneumatic tire that can be powered through its axle by any conventional drive system has been announced by the aviation products division of The Goodyear Tire & Rubber Co., Akron, O. Called Terra-Tire, it can take trucks, trailers, and other off-the-road vehicles over all types of terrain and roadways at speeds up to 65 miles an hour, the company declares. This high flotation tire is said to be free of the weight and mechanical complications that burdened previous tires of its type. It is available in a wide range of sizes. Inflation pressure is between 3-5 pounds.

Goodrich Dacron and Rubber Fire Hose

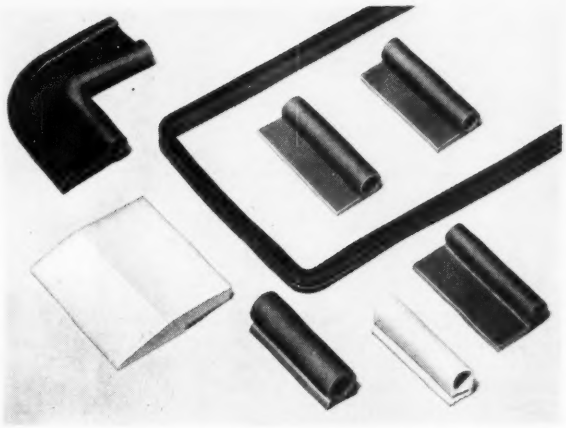
A lightweight fire hose constructed with a jacket woven of Dacron filler yarns and an oil- and chemical-resistant rubber cover has been developed for use in refineries and oil fields by The B. F. Goodrich Co. Industrial Products Division, Akron, O. Designated Pinnacle hose, it is said to be about 50% lighter than conventional rubber fire hose, to be very flexible, and to withstand water pressure up to 400 psi.

U.S. Royal Golf Ball

A new golf ball with a silicone liquid center, a higher-tensioned rubber thread, and a thinner cover has been announced by United States Rubber Co. Carrying the U.S. Royal trade mark, the ball is claimed to be lively, durable, resistant to cutting, and washable. Four types of balls are available, in a choice of diamond or dimple cover markings: U.S. Royal Special (for tournament play), U.S. Royal Blue, U.S. Royal Red, and U.S. Queen Royal (for female golfers).

Thorobred Deep Skid Truck Tire

A deep-tread truck tire said to give up to 55% more mileage, more recaps, and superior traction has been introduced by The Dayton Rubber Co., Dayton, O. Called Thorobred Deep Skid, the tire features a deeper tread and a carcass of 2200 denier super cordura rayon. According to the company, the tire is especially suited to long, heavy-load runs at sustained speeds.



Molded and extruded Cohrlastic Rubber seals

Valron-Reinforced Silicone Rubber Parts

Molded and extruded parts made of Cohrlastic HT 655 and HT 666, new silicone rubber formulations said to have tensile and tear strengths and elongation properties more than double those of conventional silicone rubber, are being offered by Connecticut Hard Rubber Co., New Haven, Conn.

According to the company, the improved properties are due to the use of Du Pont's Valron, an ester-coated fine silica filler. Previous attempts to use Valron as a reinforcing material for silicone rubber have been hindered by its rapid cure and its tendency to overcure at high temperatures, Connecticut Hard Rubber declares, but this problem has now been eliminated through the inclusion of an inhibitor in this silione rubber formulation.

Data supplied by the company show a comparison between some of the physical properties of a commercial silicone rubber compound and Cohrlastic HT 655, as given in the table which follows:

	Commercial Compound	Cohrlastic HT 655
Tear strength, lb./in., @		
room temperature	101	197
400° F	23	100
Tensile strength, psi., @		
room temperature	695	1,650
400° F	270	665
Elongation, %, @		
room temperature	390	900
400° F	230	390

HT 655, a 50-durometer methyl-base material, is said to be particularly designed for high-temperature work but will also remain flexible at —65° F.

The HT 666, a 60-durometer methyl phenyl-base material, has original properties equal to or better than those of HT 655 in tear resistance, is slightly lower in tensile strength and elongation, and has outstanding low-temperature flexibility at —100° F., the company reports.

Quaker Vacuum Molding Rubber Bags

Molded rubber blankets or bags for use in the vacuum molding of reinforced plastic laminates are being offered by Quaker Rubber Division of H. K. Porter Co., Inc., Philadelphia, Pa. The bags will be made from specific molds shipped to the company, except for such large articles as ship hulls, in which case Quaker will send its engineers to the customer's location to do the work. The new method will enable plastic manufacturers to vacuum draw their products in a mold, instead of pressure-forming them, which process is more expensive.

The Quaker bags will be made from high-grade rubber stock and will be able to withstand temperatures up to 250° F., the company says.

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POLYPOL S-70 is a coprecipitate of pine wood lignin and a butadiene-styrene copolymer. Because of the remarkable reinforcing properties of the lignin, POLYPOL S-70 permits

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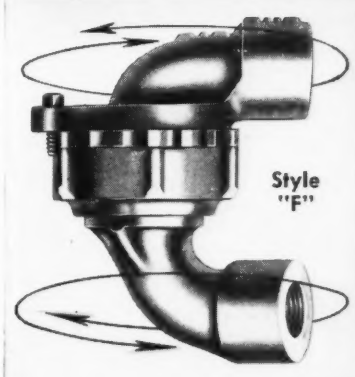

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INTERNATIONAL TECHNICAL ASSISTANCE DIVISION I.T.A. THE DAYTON RUBBER CO. DAYTON, OHIO

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BOOK REVIEWS

"The Van Nostrand Chemist's Dictionary." Edited by J. M. Honig, M. B. Jacobs, S. Z. Lewin, W. R. Minrath, and George Murphy. D. Van Nostrand Co., Inc., New York, N. Y. Cloth, 6 by 9 inches, 765 pages. Price, $10.

Planned to meet the needs of the chemist and the engineer, this dictionary contains more than 11,000 definitions of laws, equations, reactions, tests, solutions, laboratory apparatus industrial processes, and equipment. Items are listed under both their proper names and common names for quick identification. The definitions are in accordance with the latest ACS nomenclatures and are systematically organized under a key-word plan that helps in cross-referencing the subjects. Here each word in a specific definition that is further defined elsewhere in the book is printed in bold-face type. This plan permits the reader to correlate all information from the various sciences on a specific point, thus providing a well-rounded, integrated knowledge of the subject.

"Chemical Trade Names and Commercial Synonyms." Second Edition. William Haynes. D. Van Nostrand Co., Inc., New York, N. Y. Cloth, 6 by 9 inches, 472 pages. Price, $8.

Containing more than 25% more entries than its predecessor, this revised and enlarged edition presents precise and complete definitions of the special names used in the chemical industry. All definitions have been brought up to date and cover abbreviations adopted to simplify the long technical names of the newer organic compounds, as well as terms coined by manufacturers.

This volume should be of value to chemists, manufacturers, purchasing agents, and all others dealing with industrial chemicals.

"How to Find a Buyer for Your Invention." By V. D. Angerman. Science & Mechanics Publishing Co., Chicago, Ill. Cloth, 5 by 7½ inches, 186 pages. Price, $2.95.

This guide for inventors lists 140 manufacturers who are currently seeking new devices and techniques, suggests a great many needed inventions in industry and business, and advises what executive to contact and how to negotiate in order to get the best terms for a new idea. Alternative methods of selling an invention are discussed, as well as such details as patent application, selecting a patent broker, and dangers in signing releases and assignments.

NEW PUBLICATIONS

"Penacolite Brittle Resins B-1A, B-16, B-22." Technical Bulletin C-6-230. Koppers Co., Inc., chemical division, Pittsburgh, Pa. 8 pages. Typical properties, physical and cure characteristics, applications, and storage and handling suggestions for these solid condensation resinous products of resorcinol and formaldehyde are reported in this brochure. The resins can be used in the compounding of rubber to augment certain properties and in modification of rubber latices to produce adhesives for rubber-to-fiber bonding.

"'Surfa-Aero-Sealz'—A Synthetic Rubber for Jet Aircraft Pavement." Naugatuck Chemical Division, Lotol and latex sales department, United States Rubber Co., Naugatuck, Conn. 8 pages. The use of the company's "Surfa-Aero-Sealz," a blend of coke-oven tar and a solvent-resistant synthetic rubber, to protect jet aircraft field pavements from the effects of jet fuel spillage is described in this illustrated booklet.

Does chelation actually represent a new kind of chemistry? Are the possibilities as exciting as many seem to think? This series endeavors to answer these—and many other—pertinent questions on this fascinating subject. It is hoped chemists, engineers and purchasing agents alike will find these answers helpful. Now on to . . .

DOW

The Chemistry of Chelation: Part II

Versene and Versenol Series · Descriptions and Uses
A measure of Value · A Suggestion

To review in capsule form: Part I introduced chelation, offered examples of typical chemical reactions, applications, and discussed future possibilities. You will remember that a chelating agent is defined as a chemical which surrounds metallic ions with a multiple-ring structure that keeps the metal chemically inactive and holds it in solution. The applications in industry are many—and new ones are being found almost daily. That, of course, brings us to another consideration: different chelating agents for different uses.

VERSENE® AND VERSENOL®

Chelating agents are commercially available from Dow as 15 different products—all based on aminocarboxylic acid derivatives. Among these, wide spectrum performance is shown by two series of products. The Versene series of products (Versene® 67, Versene 100, Versene Powder, Versene Beads, Versene 9 and Versene Acid) is based on EDTA* and the sodium salts of this material. The Versenol series (Versenol® 120, Versenol Powder and Versenol Beads) consists of various physical forms of Na_3 HEDTA**. The Versene series, except for Fe+++ in the alkaline pH range, is generally the stronger series of the two (more completely chelates the last traces of metal). The Versenol series is notably stronger for Fe+++ in the mildly alkaline pH range and is usually cheaper on a performance basis if the consumer can tolerate the weaker chelate structure. Versene is the strongest, most stable commercially available chelating agent. It is the one with the greatest number of successful applications.

DESCRIPTIONS AND USES

Here are three Dow chelating agents together with their descriptions and uses:

Versene 100 is a concentrated aqueous solution of a technical grade of the tetrasodium salt of EDTA . . . widely used in textile processing, detergent formulations and metal cleaning.

Versene Acid is a dry form of EDTA technical. It is used in many operations as a raw material for the preparation of various derivatives, such as metal chelates, salts (K, NH_4), esters and many others.

Versenol 120 is a concentrated aqueous solution of a technical grade of Na_3 HEDTA. It is also very valuable to detergent, textile and metal-cleaning processes.

Naturally these three specific agents are not the answer to *every* problem. That's the reason for the many other Versene products, to be discussed in Part III.

A MEASURE OF VALUE

A measure of the broad performance capacity of a chelating agent can be obtained from its *chelation value*—determined on a reference metal. Calcium is used as the reference metal under the standard test proceedure accepted by the industry. Dow prefers this "performance basis". It specifies more clearly what chelating agents *actually accomplish* than such terms as "% solids" and "% active". Consequently, the "100" in Versene 100 means that one gram of this product will chelate 100 milligrams of calcium carbonate in accordance with the standard test procedure. By the same token, one gram of Versene 67 will chelate 67 milligrams, and so on.

A SUGGESTION

Two closing thoughts: Dow wants to help in any way possible to further develop the applications for chelation. Also important, Dow would like to hear from *you*—your thoughts, reactions, suggestions. Please inquire about any problems or ideas you may have. Information or actual technical assistance will be forthcoming promptly. Write, on your company letterhead, to Technical Service and Development. Dept. SC 912N, THE DOW CHEMICAL COMPANY, Midland, Michigan.

*Ethylenediaminetetra acetic acid

**Trisodium salt of N-hydroxyethylethylenediaminetriacetic acid

THE NEXT TOPIC IN THIS SERIES

PART III *October*

Specific chelating agents for specific applications. Polymerization of synthetic rubber (development of Versene® Fe-3 for controlled release of traces of metal used as catalyst—improvement in process that results in Latex stabilization).

you can depend on DOW CHEMICALS

DOW

Publications of Dow Corning Corp., Midland, Mich.:

"Silastic Newsletter." Vol. IV, No. 1. 11 pages. This review issue of the Newsletter contains all the important information and data presented in Vol. III, editions 2 through 5, published since May, 1955.

"Silicone Notes." Reference 1-207a. 1 page. This data sheet contains a brief table of typical properties of seven Silastic gums which are said to enable compounders to produce a variety of different stocks with a minimum of inventory.

Publications of Evans Chemetics, Inc., New York, N. Y.:

"Thiomalic Acid." F121-4-54. 1 page. The properties and specifications of this material, said to be a crepe rubber color reducer and a tackifier for butadiene-type synthetic rubber, are contained on this data sheet.

"Thiophenol." F129-7-54. 1 page. Included here are the properties and bibliography of this rubber plasticizer or polymerization regulator.

"Diphenyl Disulfide." F171-6-55. 1 page. Properties, specifications, and bibliography of this chemical, said to be a vulcanizing agent, are reported here.

"Thiovanic Acid." Form 50A-7-51-2. 3 pages. Properties, specifications, and typical reactions of the company's vacuum distilled thioglycolic acid, said to show promise as a modifier in polymerization, are contained in this folder.

Publications of B. F. Goodrich Chemical Co., Cleveland, O.:

"Hycar Technical Newsletter." Vol. V, No. 1. 8 pages. This is the revised and corrected copy of a similarly numbered issue first released in February.

"Hycar Technical Newsletter." Vol. V, No. 2. 8 pages. This issue discusses Hycar recipes meeting Aeronautical Material Specifications 3202E, 3211A, 3215F, 7260, 7270B, and 7274C. Extensive test data are included.

Publications of E. I. du Pont de Nemours & Co., Inc., elastomers division, Wilmington, Del.:

"The Elastomers Laboratory." 24 pages. The company's new elastomers laboratory at Chestnut Run, near Wilmington, is described in this illustrated booklet.

"Hypalon Synthetic Rubber." 8 pages. The uses and physical and chemical properties of "Hypalon" are listed in this illustrated sales brochure.

"A Primer for Use with 'Hypalon' Maintenance Paints." D. J. Kelly. Report BL-313. 4 pages. A recipe for a primer that can be used to increase the adhesion of "Hypalon" 20 maintenance paints or coatings to a metal surface is included in this technical report.

"This Is Farrel-Birmingham." Bulletin No. 59. Farrel-Birmingham Co., Inc., Ansonia, Conn. 44 pages. The company's ability to design and manufacture a wide variety of heavy machinery and machine tools is described in this illustrated booklet.

"MIL M-19379(SHIPS)." Department of the Navy, Bureau of Ships, Washington, D. C. 15 pages. This is a new Bureau of Ships Military Specification covering a rubber resilient mounting for use aboard naval vessels. It is specified to have a natural frequency from 16 to 11 cycles per second over a load range from 15 to 25 pounds. The resilient element shall be fabricated of oil-resistant compounds utilizing polymerized chloroprene or a copolymer product of butadiene and acrylonitrile as the basic material, molded to a specified form.

"Heating Cable." No. 19-675. General Electric Co., construction materials division, Bridgeport, Conn. This booklet contains product, application, and installation information and collateral data to help in the selection and installation of the company's heating cable for specific tasks.

"Manual and Automatic Valves." P-K Industries, Inc., North Arlington, N. J. 20 pages. Specifications, photographs, descriptions, and applications of the company's valves for high pressures and temperatures are contained in this catalog.

"Stabelan Stabilizers #110, #115, and #120." Bulletin #15-29-1-2-56. Harwick Standard Chemical Co., Akron, O. 3 pages. Specifications, uses, and other technical data covering the company's new liquid stabilizers for polyvinyl chloride resins are contained in this publication.

"Acrylo-News." Vol. 1, No. 1. American Cyanamid Co., New York, N. Y. 20 pages. This is the first issue of a new bi-monthly Acrylo-News series which has loose sheets for reference and filing purposes. Contained here are patent extracts relating to the use of acrylonitrile in the production of chemical intermediates, plastics, polymers, synthetic rubber, and textiles.

"Solvay Hydrogen Peroxide." Solvay Process Division, Allied Chemical & Dye Corp., New York, N. Y. 22 pages. The properties, uses, and handling of the company's hydrogen peroxide are described in this illustrated booklet. Applications include the production of porosity in foam rubber, as a catalyst in polymerization, and in the syntheses of organic and inorganic chemicals.

"Ethers and Oxides." F-4764. Carbide & Carbon Chemicals Co., division of Union Carbide & Carbon Corp., New York, N. Y. 64 pages. Discussed are physical properties, solubilities, test methods, and applications of 32 of the company's ethers and oxides which are solvents and intermediates in the rubber, plastics, textile, and other industries.

"'Het' Anhydride." Bulletin No. 43. Hooker Electrochemical Co., Niagara Falls, N. Y. 22 pages. The properties, typical reactions, and suggested uses of the company's chlorendic anhydride are contained in this booklet. The material is a hardener or curing agent for liquid epoxy resins. Test data on typical laminates of "Het" Anhydride and epoxy resin reinforced with glass cloth are included.

"1956 Year Book." The Tire & Rim Association, Inc., Akron, O. 187 pages. Price $3.50. The Association's latest tire and rim standards for passenger cars, trucks and buses, airplanes, and off-the-road, agricultural, and industrial vehicles are included in this year book.

"Rubatex News-Letter." April 16, 1956. Rubatex Products, Inc., New York, N. Y. 3 pages. Recipes for electrically conductive closed-cell rubber compounds for gaskets and shoe soles are presented in this issue, as well as pre- and post-cure test data on the stocks. The compounds are considered, however, only starting points for further development work.

"Room Temperature Bonding." Rubber & Asbestos Corp., Bloomfield, N. J. 8 pages. This reprint of an article first published in *Modern Plastics* discusses the new epoxy-based adhesives which require neither heat cure nor pressure for bonding plastics, metals, and other materials.

"Material Flow and Level Sensing Devices." Technical Reference No. 55D. Richardson Scale Co., Clifton, N. J. 2 pages. The firm's automatic sensing devices for indicating a lack of material supply or flow in a handling operation are described and pictured on this data sheet.

"The Story of Unitane TiO_2." American Cyanamid Co., New York, N. Y. 16 pages. This illustrated brochure discusses the history and properties of titanium dioxide and the company's contribution to its development in this country.

"Seiberling Product and Data Book." Seiberling Rubber Co., Akron, O. 86 pages. Designed for Seiberling salesmen and distributors, this tabbed and illustrated book gives specifications on the company's truck and special-purpose tires, data on passenger-car tires, and such technical information as speed and load ratios, load distribution, and tire mounting.

(Continued on page 486)

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W

SLIPPERY UNCURED RUBBER?

Yes—

WHEN IT'S DIPPED, SPRAYED OR BRUSHED WITH

GLYCERIZED LUBRICANT

(LIQUID CONCENTRATE)

THE ALL PURPOSE RUBBER LUBRICANT FOR

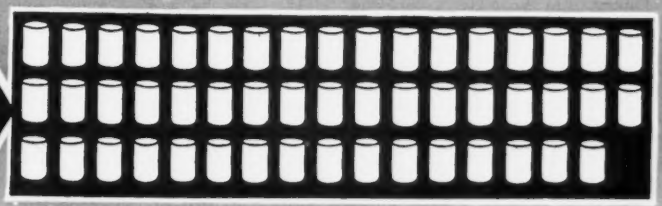
NATURAL SYNTHETIC AND RECLAIM STOCKS

Prevents adhesion of hot rubber slabs when piled . . . banishes dust nuisance by replacing soapstone or talc . . . prevents sticking during cure of extrusions and flat pan coiled tubing . . . excellent release agent for molds, mandrels, air bags, belt drums . . . equally satisfactory for washing and finishing inner tubes; imparts satiny finish . . . greatly aids in the processing of insulated wire and cable. The Production Departments and Laboratories of many rubber manufacturers, through years of using GLYCERIZED, give ample proof of its outstanding qualities as a lubricant for natural, synthetic and reclaimed stocks.

Economical? HERE'S WHY

HIGHLY CONCENTRATED

1 drum makes up to 50 drums of working solution.



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RUBBEROL AND **SYNTHOL** TWO OTHER FACTORY PROVED RUBBER PROCESSING AGENTS

QUALITY SINCE 1884

GENSEKE BROTHERS

RUBBER MATERIALS DIVISION

West 48th Place and Whipple Street Chicago 32, U.S.A.

MARKET REVIEWS

Natural Rubber

Natural rubber prices on both the spot and futures markets continued their decline during the April 16-May 15 period, with the #1 grade registering an overall loss of about 2¢ a pound. Again, as has been the case for the past several months, too much available rubber and too few takers served to perpetuate the sliding price levels. On the New York Commodity Exchange, only 41,470 tons of R.S.S. #1 were traded, indicating the continuing shyness of buyers.

Beginning the period at 32.75¢, R.S.S. #1 fell steadily to 30.38¢ by May 1, then leveled off, ending the period at 30.50¢. Essentially, the stopping of the decline was brought about by Goodrich-Gulf's action in raising the price of its SBR synthetic rubber from 23¢ to 23.9¢ and the feeling that other producers would soon follow suit. Greater recoveries might have been effected, but President Eisenhower's optimistic appraisal of the synthetic rubber situation, made April 30, minimized the gain.

On May 10 a steadiness was again introduced into the natural rubber market when Malayan plantations were beset by a slowdown of workers demanding higher wages. If the slowdown turns into a full-blown strike, higher natural rubber prices would certainly seem to be called for. Observers, however, believe that the reduction in the American automotive work week, resulting in less consumption of rubber, will negate such a possible upward trend.

Statistically, on the New York Commodity Exchange, sales for the second half of April were 24,260 tons, bringing the monthly total to 43,600 tons. Sales during the first half of May were 17,210 tons. Near-May stocks began the period at 32¢ a pound for the #1 grade and dropped to 29.85¢ on May 15. There were 22 trading days during the period.

COMMODITY EXCHANGE
WEEK-END CLOSING PRICES

Futures	Mar. 23	Apr. 20	Apr. 27	May 4	May 11
Mar.	31.80	....	....	....	....
May	32.40	31.80	29.40	30.60	29.85
July	31.85	31.65	29.60	30.80	30.00
Sept.	31.35	31.00	29.35	30.50	29.65
Dec.	30.50	30.25	29.15	30.25	29.45
Total weekly sales, tons	11,860	9,460	11,420	9,910	6,130

On the physical market, average April monthly spot prices for representative grades were as follows: R.S.S. #1, 32.19¢; R.S.S. #3, 31.71; #3 Amber Blankets, 30.33¢; and Flat Bark, 22.65¢. There were 21 trading days during April. For the first half of May, R.S.S. #1 averaged 30.50¢.

NEW YORK SPOT MARKET
WEEK-END CLOSING PRICES

	Mar. 23	Apr. 20	Apr. 27	May 4	May 11
R.S.S.: #1	33.25	32.25	30.50	31.13	30.38
2	33.00	32.00	30.25	30.88	30.25
3	32.75	31.88	30.13	30.75	30.13
Latex Crepe					
#1 Thick	37.75	37.75	36.25	36.50	36.25
Thin	37.75	37.75	36.25	36.50	36.25
#3 Amber Blankets	31.75	30.50	27.38	27.75	27.13
Thin Brown Crepe	31.38	29.88	27.00	27.38	26.75
Flat Bark	23.75	22.75	21.63	21.88	21.25

Synthetic Rubber

Attorney General Brownell's statement in his report to Congress on May 1 that the rigid price structure of American synthetic rubber has shown no relation to supply-and-demand factors may be the green light SBR producers have been waiting for to raise the prices of some of their products. Despite the upward trend of production costs, these producers have been ethically committed to keep prices as low as possible for as long as possible. Such commitments were made at the time of the sale of the government plants, but they were then recognized as non-binding, beyond the force of legality, and were given, in effect, to mollify opponents of the sale.

The action of Goodrich-Gulf on April 30 in increasing the price of general-purpose synthetic rubber from 23 to 23.9¢ a pound supports the widespread contention that the artificial price ceiling is no longer realistic. The company said it was forced to boost prices to recover higher costs of labor, component materials, and increased freight rates.

President Eisenhower's April 30 report to Congress estimated the free world market for synthetic rubber would more than triple by 1960 to a potential requirement of 600,000 long tons annually. Since the United States is now and will continue to be the world's major source of synthetic rubber, the chief executive's confirmation of this growing export market for our rubber will certainly add to the pressure for higher synthetic prices.

Still more fuel will be heaped on the fire by the government's sale of the last of its plants, at Louisville, Ky., to Union Carbide & Carbon on May 17. Here the higher-cost butadiene from alcohol is being made, and the SBR from which it is manufactured must logically be sold at a higher price than SBR from the cheaper petroleum-based butadiene.

How soon the nine other major producers of synthetic rubber will follow the Goodrich-Gulf lead cannot now be predicted. But the feeling that the artificial price ceiling cannot be maintained much longer has never been so strong as now.

Butaprene S Now "FR-S"

The synthetic rubber and latex division of The Firestone Tire & Rubber Co., Akron, O., has changed the name of its butadiene-styrene types of polymers and latices from Butaprene S to FR-S. Designated numbers of the products will remain the same.

Latex

The price of *Hevea* latex continued to fall during the period from April 16 to May 15 in sympathy with R.S.S. grades. Nevertheless, buying did not approach the higher levels of the previous period. Most buying was said to be in the more forward positions, at least up to the end of the year. Trading in the nearer positions was extremely slow. Meanwhile supplies of latex in the Far East continued to build up, making for a disjointed supply-demand situation. American stocks were thought to be strong.

Reports indicated that purchasing of American synthetic latices was also lagging. It would seem that cuts in automotive production were affecting all segments of the latex market. Synthetic latex stocks appeared to be good.

Prices for ASTM Centrifuged Concentrated natural latex, in tank-car quantities, f.o.b. rail tank cars, ranged during the period from 37 to 42¢ per pound solids. As of this writing, prices of synthetic latices remained the same, being quoted as SBR, 26-32.3¢; neoprene, 37-47¢; and N-type, 46-54¢.

Final February and preliminary March domestic statistics for all latices were reported by the United States Department of Commerce as follows:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
Feb.	0	7,671	6,399	16,735
Mar.	0	....	6,138	17,995
SBR				
Feb.	6,846	97	5,913	7,011
Mar.	5,869	....	6,043	6,851
Neoprene				
Feb.	930	0	787	1,162
Mar.	782	0	714	1,107
Nitrile				
Feb.	827	0	730	1,943
Mar.	1,158	0	733	1,719

Reclaimed Rubber

The reclaimed rubber market slowed considerably during the period from April 16 to May 15 as automotive production declined. There was little to indicate the trend of the period ahead. Some producers ex-

CYANAMID RUBBER
Chem Lines

NO. 5
A SERIES

Published by AMERICAN CYANAMID COMPANY, Rubber Chemicals Department, Bound Brook, New Jersey

Thiazole Production Expands

It is gratifying to announce that equipment is now installed which will increase Cyanamid's production of Thiazoles.

The demand for these rubber accelerators, as shown in the chart below, has kept pace with the expansion of the rubber industry. This industry consumes Thiazole either in its basic form as mercaptobenzothiazole, or in its modified forms as benzothiazyl disulfide or the sulfenamides.

Cyanamid's latest expansion of its production facilities for these vital products has included the installation of new and better equipment, and the modernization of existing equipment. Thus, high quality standards will be maintained and enhanced.

One of the plus values to be derived will be an improved package for MBTS. While containing the same quantity of material as formerly, the new bag will be more compact. This will permit a much neater unit load and will give users the advantage of less storage space requirements – whether they purchase in unit loads or by the bag.

The nerve center of the new equipment is a central control panel. From this one point, the progress of Thiazole production can be controlled and charted. Elaborate precautions are taken to guard against impurities and to screen out any part of the product that does not meet Cyanamid's rigid specifications.

With the installation of this new equipment, Cyanamid will be in a position to meet the Thiazole requirements of all of its customers promptly.

For technical information on Cyanamid's Thiazole Accelerators, MBT and MBTS, write for Rubber Chemicals Technical Bulletin No. 839.

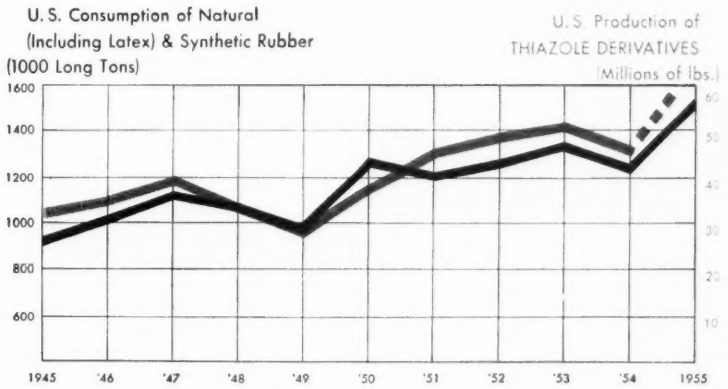
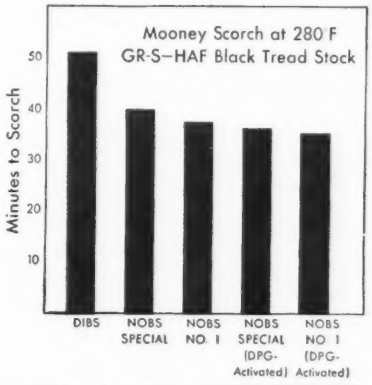


Chart demonstrates parallel between total U. S. Thiazole production and total U. S. rubber consumption. *(Source: U. S. Dept. of Commerce)*

Keeping Ahead of the Parade



The parade of progress in accelerators for vulcanization of rubber is steady and unceasing. It is not necessary to look back many years to witness the trend from guanadines to mercaptobenzothiazole, to benzothiazyl disulphide, to the sulfenamides, as primary accelerators for tire tread stocks. We have felt that our NOBS* SPECIAL Accelerator gives the ultimate in scorch protection and will handle the most severe problem.

Recently, we have heard the ominous rumblings that even more process safety is needed. High speed and high-pressure mixing equipment, higher extrusion speeds, the use of super abrasion fine particle size furnace blacks, and continually higher curing temperatures have all pointed to the need for a super delayed-action accelerator. Our newest product, DIBS* Accelerator, has been developed specifically for this need.

DIBS Accelerator is N,N-diisopropyl benzothiazole-2-sulfenamide. Its melting range of 131° to 139°F permits easy incorporation into furnace black stocks. DIBS has good storage stability under normal temperature conditions. At 268°F, DIBS gives decidedly more delayed action than NOBS SPECIAL as shown by the Mooney Scorch time.

We visualize the need for this new accelerator in tire treads, industrial belts, tank blocks and other mechanical goods in which super abrasion furnace blacks are or will be used. It will be useful in other stocks where the scorch problem is too great to be satisfactorily handled by the NOBS Accelerators. To prepare for this we are producing DIBS in semi-commercial quantities so that full-scale plant trials can be run by interested customers.

Write for sample of this new product and additional technical information contained in a Special Report.

*Trademark

pected the warmer weather of June and July to stimulate business conditions, but this prospect was by no means certain.

No changes were made in reclaimed rubber prices during the period.

RECLAIMED RUBBER PRICES

	Lb.
Whole tire: first line	$0.105
Fourth line	.0925
Inner tube: black	.15
Red	.21
Butyl	.15
Pure gum, light colored	.23
Mechanical, light colored	.135

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Scrap Rubber

Routine business characterized the scrap rubber market during the period from April 16 to May 15. Some increased interest was noted in tire buffing, but interest in auto tubes was negligible. Prices of all scrap rubber grades were unchanged from last month's quotations.

According to the Bureau of the Census, United States Department of Commerce, exports of scrap rubber during 1955 came to 37,208,501 pounds, valued at $1,288,343, contrasted with 30,522,059 pounds, worth $763,228, during 1954.

Imports of scrap rubber in 1955 totaled 25,423,023 pounds, valued at $1,147,438, compared with 23,654,290 pounds, worth $1,021,442, in the preceding year.

December, 1955, exports totaled 3,275,550 pounds, valued at $139,669. Scrap rubber imports for January of this year declined to 2,183,163 pounds, valued at $135,818, from December's 3,098,465 pounds, worth $148,252.

Period-end buying prices for scrap rubber grades follow:

	Eastern Points	Akron, O.
	(Per Net Ton)	
Mixed auto tires	$14.00/16.50	$16.50
S.A. G. auto tires	Nom.	Nom.
Truck tires	14.00	17.00
Peelings, No. 1	41.00/42.00	41.00/42.00
2	23.00	25.00
3	17.00	19.00
Tire buffing	15.00	14.00/15.00
	(¢ per Lb.)	
Auto tubes, mixed	3.50	3.50
Black	5.75	5.75
Red	6.50	6.50
Butyl	Nom.	Nom.

Cotton Fabrics

Slow trading characterized the industrial fabrics market during the period from April 16 to May 15. Trading in wide industrial fabrics for plastic coating and other uses, as well as trading in cotton ducks, was confined mainly to sales for spot and nearby delivery, with some buyers entering the market for specific fabrics and trying for rush deliveries.

A steady call for various types of goods served to give the market a firmer undertone. It was believed that coaters and other users of industrial fabrics were generally not offering goods at price concessions, but were holding on to them with a view to putting them into production at a later date.

Prices for forward deliveries were said to be uncertain since there was a lack of interest in covering ahead. It is likely that any big orders for future delivery would result in some price concessions because mills generally have few orders calling for delivery of industrial fabrics in the third quarter.

No price changes occurred during the period.

COTTON FABRICS

Drills		
59-inch 1.85 yd.	yd.	$0.39
2.25-yd.		.33/.335
Ducks		
38-inch 1.78-yd. S.F.	yd.	nom.
2.00-yd. D.F.		.34
51.5-inch, 1.35-yd. S.F.		.4963
Hose and belting		.69
Osnaburgs		
40-inch 2.11-yd.	yd.	.265
3.65-yd.		.1675
Raincoat Fabrics		
Printcloth, 38½-inch, 64x60, 5.35-yd.	yd.	.15
6.25 yd.		.1275
Sheeting, 48-inch, 4.17-yd.		.20
52-inch, 3.85-yd.		.24
Chafer Fabrics		
14.40-oz./sq. yd. Pl.	yd.	.70
11.65-oz./sq. yd. S.		.61
10.80-oz./sq. yd. S.		.6575
8.9-oz./sq. yd. S.		.67
Other Fabrics		
Headlining, 59-inch, 1.65-yd., 2-ply	yd.	.465
64-inch, 1.25-yd., 2-ply		.595
Sateens, 53-inch, 1.32-yd.		.5675
58-inch, 1.21-yd.		.62
Tire Cord		
1242 Standard	lb.	.83

Rayon

Total calculated production of rayon and acetate yarn during April was 64,500,000 pounds, of which 30,300,000 pounds were regular-tenacity yarn, and 34,200,000 pounds were rayon high-tenacity yarn. March production had been: total, 71,000,000 pounds; regular-tenacity, 34,400,000 pounds; and high-tenacity, 36,600,000 pounds.

Total domestic shipments for April were 58,100,000 pounds, consisting of 27,100,000 pounds of regular-tenacity yarn and 31,000,000 pounds of high-tenacity rayon yarn. March shipments had been: total 66,300,000 pounds; regular-tenacity, 30,200,000 pounds; and high-tenacity, 36,100,000 pounds.

Total end-of-April stocks were 55,000,000 pounds, of which 45,200,000 pounds were regular-tenacity yarn and 9,800,000 pounds were high-tenacity rayon yarn. End-of-March stocks had been: total, 49,500,000 pounds; regular-tenacity, 42,400,000 pounds; and high-tenacity, 7,100,000 pounds.

No new price cuts were made during the period by rayon tire yarn producers. The current price range of tire yarns and fabrics is given below.

RAYON PRICES

Tire Yarns	
High-Tenacity	
1100/ 480	$0.62/$0.67
1100/ 490	.62/ .67
1150/ 490	.67
1165/ 480	.68
1230/ 490	.67
1650/ 720	.58/ .64
1650/ 980	.58/ .64
1875/ 980	.64
2200/ 960	.58/ .63
2200/ 980	.58/ .63
2200/1466	.67
4400/2934	.63
Super-High-Tenacity	
1650/ 720	.63/ .69
1900/ 720	.69
Tire Fabrics	
1100/490/2	.77
1650/980/2	.725
2200/980/2	.715

Indo-China

(Continued from page 456)

subject[1] came to the attention of the Institute, and this author's findings could be corroborated.

Mechanical stability, KOH number and the viscosity of centrifuged latex vary with time—the nature of the soil in which the tree grows and its vegetable origin are factors in these changes. Latex of different origin, however, can be mixed, and these variability factors thus largely eliminated.

Investigations at the Institute centered chiefly on the effects of simple modifications in the centrifugation technique on variability with the ultimate purpose of utilizing findings to give useful direction to the evolution of the properties of the centrifuged latex. It was found that more or less prolonged treatment of latex with fairly large amounts of ammonia before centrifuging led to pronounced instability in the presence of zinc oxide. A slight improvement in mechanical stability and a slight decrease in the KOH number and viscosity followed preliminary decantation of the latex. This procedure, however, is not recommended for latex tending to be unstable in the presence of ZnO.

Dilution of latex before centrifugation, as Kidder had shown, has a favorable effect on properties. But in certain cases, notably in latices rich in magnesium, the opposite effect is obtained because dilution results in an excessive magnesium content with consequent decreased mechanical stability. Dilution by addition of 40% water gives a marked decrease in KOH number; its effect on viscosity invariable, but on the whole there is a slight tendency to decrease. Another effect is that while the content of soluble substances in latex normally increases with time, dilution brings about a substantial decrease.

[1] India RUBBER WORLD, 124, 563, 575, 699 (1951).

DOW

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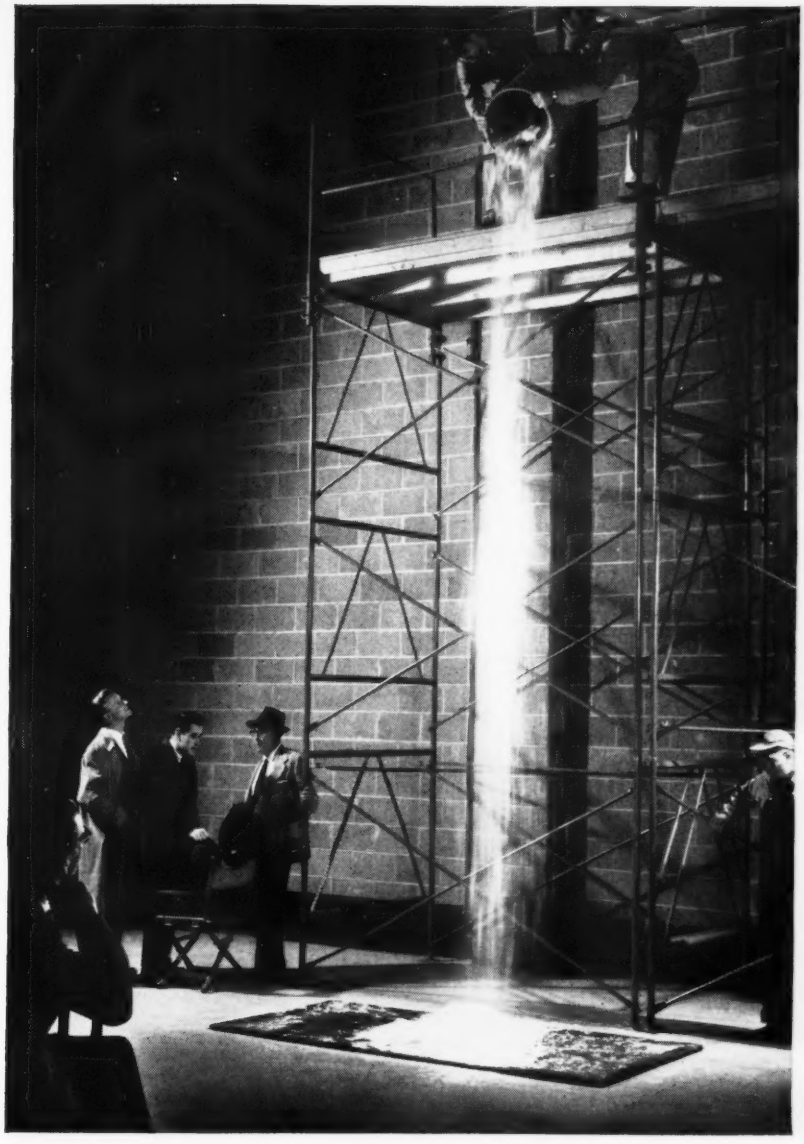

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3. Better employee relations

For these reasons—and long-run economy, too—you'll want to inspect this new product firsthand. We will gladly send you a free sample of the new Dow dustless industrial salicylic acid. Simply fill out and mail the coupon. You and your company will be glad you did!

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DOW

STATISTICS of the RUBBER INDUSTRY

U.S.A. Imports and Production of Natural (Including Latex and Guayule) and Synthetic Rubber (in Long Tons)

Year	Natural	GR-S	SBR-Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1945	135,672	717,693	7,163	52,378	45,672	7,871	966,449
1946	400,687	612,687	721	80,823	47,766	5,738	1,148,422
1947	688,354	405,496	3,362	62,824	31,495	6,618	1,198,149
1948	735,227	390,240	15,252	56,662	34,848	7,012	1,239,241
1949	660,792	288,882	21,717	54,046	35,215	11,072	1,071,724
1950	802,249	350,801	28,086	60,915	50,067	12,037	1,304,155
1951	733,048	694,583	9,946	76,475	58,907	15,333	1,588,292
1952	805,997	636,969	17,885	81,630	65,745	16,228	1,624,454
1953	647,615	668,386	12,342	79,801	80,495	20,198	1,508,837
1954	596,848	472,698	17,707	58,802	69,150	21,396	1,236,601
1955							
Jan.	49,941	57,607	1,436	3,220	6,983	2,215	121,402
Feb.	50,880	55,293	1,149	3,727	6,910	1,659	119,618
Mar.	61,250	63,940	1,229	5,256	7,132	2,409	141,216
Apr.	61,113	50,745	10,081	5,148	8,359	2,433	137,879
May	61,042	3,592	63,220	5,115	7,852	2,720	143,541
June	52,762	3,739	61,717	3,872	5,919	3,422	131,431
July	43,626	1,640	64,910	5,395	6,904	3,195	125,670
Aug.	59,840	.....	68,898	4,203	8,511	2,792	144,244
Sept.	50,459	.....	68,228	5,097	7,677	2,821	134,282
Oct.	45,720	.....	73,103	5,501	8,118	2,958	135,400
Nov.	50,509	.....	75,745	4,935	8,537	2,931	142,657
Dec.	48,032	.....	74,813	4,710	8,455	3,068	139,078
Total	635,174	236,556	564,589	56,179	91,357	32,623	1,616,478
1956							
Jan.	58,803	.....	76,028	6,896	8,207	3,125	153,059
Feb.	53,353	.....	73,457	6,229	8,560	2,989	144,588
Mar.*	.....	.....	77,298	5,662	7,822	3,607	.....

* Preliminary.
Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

U.S.A. Consumption of Natural (Including Latex) and Synthetic Rubber (Long Tons)

Year	Natural	GR-S	SBR-Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1945	105,429	593,434	1,711	43,012	42,394	8,029	799,009
1946	277,597	631,405	721	79,228	44,357	5,988	1,039,296
1947	562,661	446,316	2,273	68,838	37,703	4,536	1,122,327
1948	627,332	334,233	11,080	58,870	32,118	5,771	1,069,404
1949	574,522	299,420	21,717	52,664	31,753	8,827	988,903
1950	720,268	388,427	27,803	66,348	43,781	11,930	1,258,557
1951	454,015	617,200	9,244	70,500	48,887	13,066	1,212,912
1952	453,846	648,816	17,604	71,229	55,522	13,866	1,260,883
1953	553,473	611,748	12,433	77,826	65,900	16,929	1,338,309
1954	596,285	483,001	17,344	61,464	57,203	17,715	1,233,412
1955							
Jan.	56,911	54,728	1,643	4,478	5,676	1,931	125,367
Feb.	50,997	54,707	1,293	4,312	5,476	1,921	118,706
Mar.	58,472	62,548	1,189	4,839	6,423	2,174	135,645
Apr.	52,963	54,091	5,655	4,321	5,884	2,172	125,086
May	54,746	2,533	60,325	4,455	6,143	1,965	130,167
June	56,282	3,666	62,226	4,704	6,320	2,581	135,779
July	46,166	2,690	50,398	3,894	4,294	1,621	109,063
Aug.	48,359	.....	59,746	4,307	6,450	2,219	121,268
Sept.	50,963	.....	63,330	4,578	6,197	2,270	127,338
Oct.	54,995	.....	66,744	4,739	6,626	2,280	135,374
Nov.	52,769	.....	68,111	4,420	6,896	2,234	134,430
Dec.	48,377	.....	63,149	4,219	6,491	2,167	124,403
Yr.-end adj.	+2,800	.....	+3,225	+725	.....	+500	+7,250
Total	634,800	234,963	507,034	53,991	72,876	26,035	1,529,699
1956							
Jan.	53,751	.....	65,375	4,223	6,684	2,198	132,231
Feb.	50,285	.....	62,366	4,155	6,430	2,289	125,525
Mar.*	49,590	.....	64,960	4,508	6,434	2,387	127,879

* Preliminary.
Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

There's more to Welkote than toughness!

Coated nylon tarps used by Norwalk Truck Line

How tough can a base fabric be? What else must it have besides durability? The vinyl coated truck tarp shown here provides some of the answers. It uses Welkote, the Wellington Sears multifilament nylon fabric specifically engineered as a base for vinyl and neoprene coating. When properly coated and fabricated, it has extremely high tear-resistance, stands up under the roughest conditions of abrasion and weather—resists deterioration caused by oil, mildew and rot. But at the same time, Welkote-based materials are light, easier to handle in use, easy to work with in fabrication! Welkote is being widely specified by coaters for tarpaulins and protective coverings of all kinds. Supplied by Wellington Sears in three basic weights, it is one of many fabrics we engineer for the coating industry, developed through our century of serving the fabric needs of many industries. For further information about Welkote, or for help in solving any problem involving fabric in combination with rubber or plastics, call us. Put our experience to work for you. For informative booklet, "Modern Textiles for Industry," write Dept. H-6.

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U.S.A. Stocks of Latex

(Long Tons, Dry Weight)

Year	Natural	GR-S*	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1943	3,638	....	....	....	....	5,638
1944	2,443	....	....	....	....	2,443
1945	3,121	....	....	....	....	3,121
1946	4,865	....	....	....	....	4,865
1947	5,033	....	....	....	....	5,033
1948	11,235	....	....	....	....	11,235
1949	5,063	....	....	....	....	5,063
1950	4,927	....	....	....	....	4,927
1951	4,752	3,727	1,245	532	5,504	10,256
1952	6,201	5,040	1,019	902	6,961	13,162
1953	13,532	4,794	1,117	721	6,632	20,164
1954	11,133	5,134	1,087	811	7,032	18,165
1955						
Jan.	9,684	5,861	1,067	812	7,740	17,424
Feb.	8,619	5,753	879	692	7,324	15,943
Mar.	7,820	6,940	909	658	8,507	16,327
Apr.	6,790	7,098	786	725	8,609	15,399
May	8,854	7,021	767	842	8,630	17,484
June	9,788	6,645	817	958	8,420	18,208
July	11,934	6,950	850	1,155	8,955	20,889
Aug.	11,962	6,201	885	1,076	8,162	20,124
Sept.	12,595	6,448	975	1,296	8,719	21,314
Oct.	12,156	5,798	1,075	1,196	8,069	20,225
Nov.	12,616	6,307	1,089	1,174	8,570	21,186
Dec.	12,628	6,480	1,236	1,282	8,998	21,626
Yr.-end adj.	+575	+500	....	+525	+1,025	+1,600
	13,203	6,980	1,236	1,807	10,023	23,226
1956						
Jan.	16,059	6,522	1,093	1,906	9,521	25,580
Feb.	16,735	7,011	1,162	1,943	10,116	26,851
Mar †	17,995	6,851	1,107	1,719	9,677	27,672

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.
* Includes SBR-Types.
† Preliminary.

U.S.A. Stocks of Synthetic Rubber

(Long Tons)

Year	SBR-Types	Butyl	Neoprene	N-Type	Total
1943	36,395	1,033	6,644	3,223	47,295
1944	122,412	9,992	12,262	5,366	150,032
1945	170,571	18,378	9,703	4,802	203,454
1946	83,090	19,478	10,470	3,755	116,793
1947	40,606	13,184	5,237	3,339	62,366
1948	96,304	10,995	5,072	2,762	115,133
1949	77,743	12,224	4,654	3,433	98,054
1950	36,942	7,243	5,733	2,840	52,758
1951	105,271	12,481	8,379	3,821	129,952
1952	83,861	22,716	8,535	3,875	118,987
1953	135,153	24,866	11,480	4,346	175,845
1954	115,499	19,267	11,349	4,280	150,395
1955					
Jan.	114,976	17,079	11,598	4,121	147,774
Feb.	111,796	15,424	10,555	3,888	141,663
Mar.	113,594	15,096	11,037	3,860	143,587
Apr.	112,156	14,813	10,863	3,612	141,444
May	109,381	14,449	10,283	3,995	138,108
June	103,844	13,053	9,755	4,042	130,694
July	110,281	13,288	11,213	5,120	139,902
Aug.	108,211	12,395	11,326	5,118	137,050
Sept.	107,641	12,190	11,209	4,995	136,035
Oct.	105,746	12,146	11,820	5,041	134,753
Nov.	105,287	11,646	11,530	5,201	133,664
Dec.	108,339	10,180	12,220	5,580	136,319
Yr.-end adj.	+650	+320	....	+450	+1,420
	108,989	10,500	12,220	6,030	137,739
1956					
Jan.	111,263	12,303	11,850	6,316	141,732
Feb.	114,389	13,027	11,888	6,602	145,906
Mar.*	118,801	13,412	12,110	7,104	151,427

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.
* Preliminary.

U.S.A. Imports and Production of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	GR-S*	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1946	8,012	24,810	13,595	....	38,405	46,417
1947	17,675	22,474	6,089	....	28,563	46,238
1948	32,630	21,494	5,022	....	26,516	59,146
1949	29,974	21,357	3,651	....	25,008	54,982
1950	54,401	31,339	5,725	....	37,064	91,465
1951	54,963	32,972	6,866	2,948	42,786	97,749
1952	48,228	42,273	7,598	4,164	54,035	102,263
1953	75,511	48,112	9,026	5,844	62,982	138,493
1954	74,483	48,379	8,214	6,866	63,459	137,942
1955						
Jan.	7,853	6,199	617	708	7,524	15,377
Feb.	6,110	5,634	797	525	6,956	13,066
Mar.	7,611	7,078	854	738	8,670	16,281
Apr.	8,550	5,680	975	972	7,627	16,177
May	8,849	5,337	880	815	7,032	15,881
June	7,736	4,777	905	1,450	7,132	14,868
July	8,702	4,800	641	951	6,392	15,094
Aug.	8,885	4,519	881	1,010	6,410	15,295
Sept.	8,109	5,769	994	1,091	7,854	15,963
Oct.	6,900	6,231	922	883	8,036	14,936
Nov.	7,085	6,933	1,004	781	8,718	15,803
Dec.	6,364	6,407	962	874	8,243	14,607
Total	92,754	69,364	10,432	10,798	90,594	183,348
1956						
Jan.	10,328	6,885	848	919	8,652	18,980
Feb.	7,671	6,943	930	827	8,700	16,371
Mar.†	.....	.....	782	1,158	.....	.....

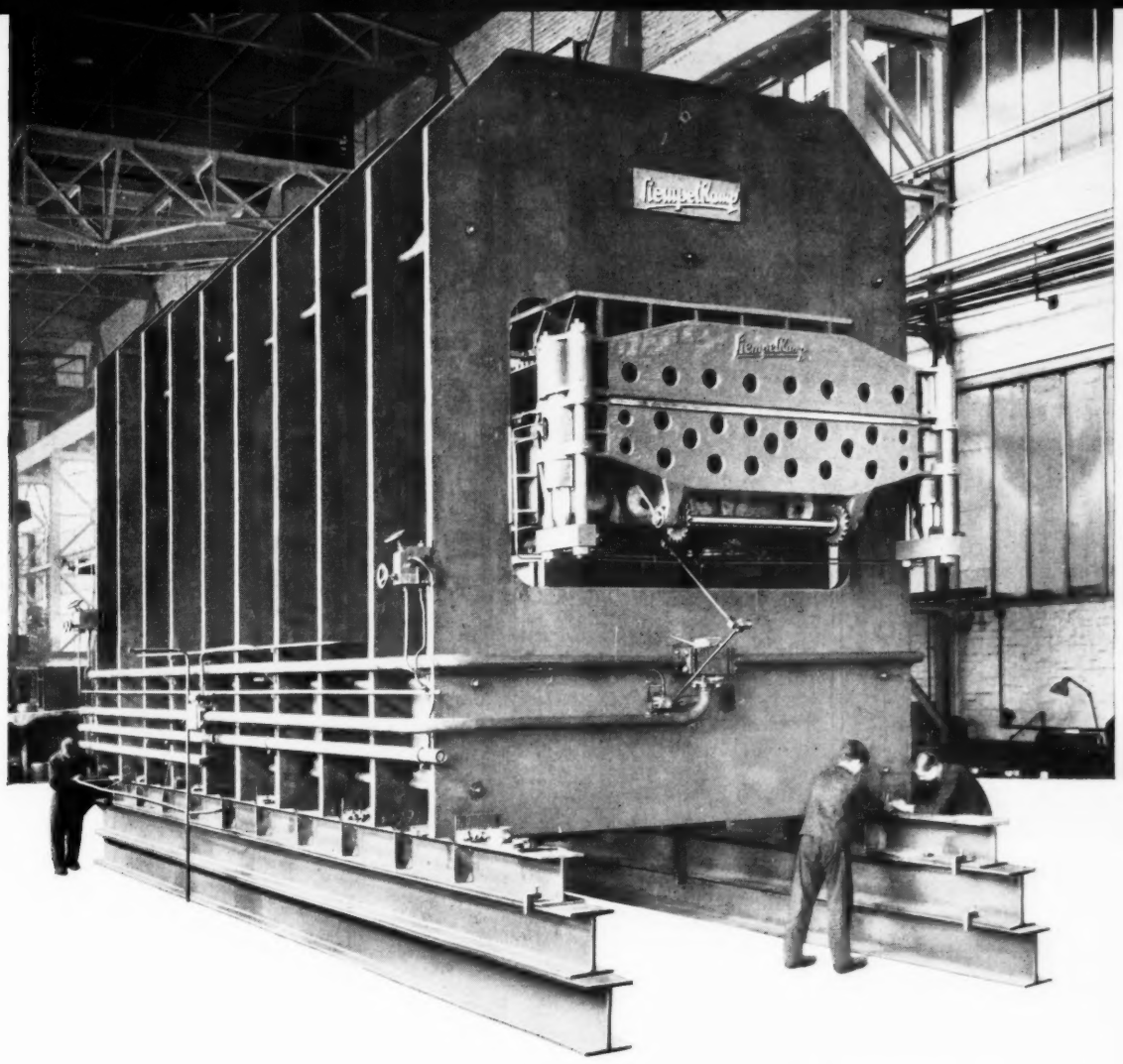
Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.
* Includes SBR-Types.
† Preliminary.

U.S.A. New Supply, Consumption, Exports, and Stock of Reclaimed Rubber

(Long Tons)

Year	New Supply	Consumption	Exports	Stocks
1946	295,612	275,410	14,461	33,666
1947	291,395	288,395	14,556	35,943
1948	266,861	261,113	11,428	32,630
1949	224,029	222,679	10,367	28,263
1950	314,008	303,733	11,740	35,708
1951	366,700	346,121	14,722	45,082
1952	274,981	280,002	11,180	30,664
1953	298,336	285,050	11,397	32,319
1954				
Jan.	20,026	19,114	912	31,865
Feb.	21,122	19,461	941	32,393
Mar.	23,383	22,882	830	32,148
Apr.	21,658	21,883	1,050	31,359
May	21,316	20,436	1,071	31,105
June	22,342	22,321	1,068	30,845
July	18,041	16,301	586	31,304
Aug.	15,519	17,660	647	27,692
Sept.	22,352	19,926	641	29,632
Oct.	23,566	22,098	808	30,395
Nov.	22,986	22,321	862	29,451
Dec.	25,790	24,546	816	30,746
Total	258,101	249,049	10,232	.....
1955				
Jan.	25,336	25,322	1,041	29,656
Feb.	25,444	24,333	1,085	30,125
Mar.	29,574	28,674	1,088	30,311
Apr.	26,817	26,609	1,088	30,068
May	27,911	27,652	1,056	29,528
June	30,451	29,157	1,128	29,725
July	24,114	22,563	1,176	29,939
Aug.	25,223	25,790	1,144	27,956
Sept.	26,512	26,340	1,018	27,110
Oct.	28,038	26,597	1,381	27,565
Nov.	29,124	27,229	1,313	28,473
Dec.	28,105	24,515	1,470	31,058
Year.-end adj.	.....	—2,000	.....	+440
Total	326,649	312,781	13,988	31,498
1956				
Jan.	26,205	25,827	1,382	31,640
Feb.	27,108	25,571	1,115	31,875
Mar.*	28,349	26,874	....	33,954

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.
* Preliminary.



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U.S.A. Automotive Inner Tubes

(Thousands of Units)

Year	Shipments: Original Equipment	Shipments: Replacement	Shipments: Export	Shipments: Total	Production	Inventory End of Period
1951	32,151	32,284	1,071	65,507	67,249	10,094
1952	29,451	32,985	1,014	63,449	65,073	12,036
1953	37,957	36,072	878	74,907	74,425	11,874
1954	25,090	35,442	948	61,480	58,397	
1955						
Jan.	413	3,629	74	4,116	3,089	8,252
Feb.	352	2,430	80	2,862	2,850	8,243
Mar.	491	2,732	105	3,328	3,234	8,217
Apr.	530	2,635	85	3,250	2,836	7,963
May	531	2,617	85	3,233	3,005	7,735
June	477	3,003	85	3,565	3,136	7,326
July	475	2,915	60	3,450	2,768	6,661
Aug.	394	3,274	65	3,733	2,923	5,917
Sept.	360	2,814	86	3,261	3,169	5,966
Oct.	319	2,595	89	3,004	3,119	6,286
Nov.	355	2,427	93	2,875	3,052	6,734
Dec.	305	2,289	92	2,686	2,719	6,833
Total	5,002	33,360	999	39,363	35,900	
1956						
Jan.	274	3,263	72	3,608	2,918	6,294
Feb.	273	2,548	100	2,921	2,969	6,547

Source: The Rubber Manufacturers Association, Inc.

U.S.A. Exports of Synthetic Rubber

(Long Tons)

Year	SBR-Types	Butyl	Neoprene	N-Type	Total
1945	76,555	980	5,837	406	83,778
1946	68,763	495	2,642	797	72,697
1947	7,951	62	2,617	755	11,385
1948	1,093	21	2,875	885	4,874
1949	1,401	178	3,330	1,574	6,483
1950	900	31	4,826	1,895	7,652
1951	483	216	6,825	1,725	9,249
1952	9,467	126	9,813	2,695	22,101
1953	7,692	237	11,494	3,245	22,668
1954	11,069	2,831	12,062	4,155	30,117
1955					
Jan.	1,381	716	1,046	194	3,337
Feb.	1,331	370	1,049	259	3,009
Mar.	2,162	672	1,287	236	4,357
Apr.	1,807	1,562	1,636	506	5,511
May	3,500	376	1,430	357	5,663
June	6,030	726	1,541	389	8,686
July	5,212	870	1,275	472	7,829
Aug.	7,727	837	1,454	386	9,567
Sept.	8,598	526	1,946	602	11,672
Oct.	7,888	1,041	1,748	444	11,121
Nov.	7,786	894	1,824	306	10,810
Dec.	7,282	1,305	1,862	442	10,891
Total	60,704	9,895	18,098	4,593	93,290
1956					
Jan.	7,550	815	1,757	506	10,628
Feb.	9,018	1,624	1,521	449	12,612

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.

U.S.A. Consumption of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	GR-S*	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1945	3,886	14,500	6,800	...	21,300	25,186
1946	5,714	23,500	13,000		36,500	42,214
1947	13,909	22,500	6,500		29,000	42,909
1948	28,489	21,500	5,250		26,750	55,239
1949	36,117	21,500	3,750		25,250	61,367
1950	56,138	31,000	5,500		36,500	92,638
1951	46,750	31,031	6,279	2,628	39,938	86,688
1952	53,567	40,562	7,368	3,093	51,023	104,590
1953	67,375	46,473	7,981	3,654	58,108	125,483
1954						
Jan.	5,882	3,475	615	275	4,365	10,247
Feb.	5,595	3,568	575	250	4,393	9,988
Mar.	6,610	3,982	729	335	5,046	11,656
Apr.	5,892	3,748	603	324	4,675	10,567
May	5,969	3,394	586	348	4,328	10,297
June	5,884	3,653	629	402	4,684	10,568
July	4,298	2,587	482	296	3,365	7,663
Aug.	5,228	2,834	561	351	3,746	8,974
Sept.	6,903	3,599	628	379	4,606	11,509
Oct.	7,527	4,347	612	376	5,335	12,862
Nov.	7,622	4,411	631	411	5,453	13,075
Dec.	7,671	4,575	600	460	5,635	13,306
Yr.-end adj.	+350			+300		
Total	75,931	44,173	7,251	4,507	55,931	131,862
1955						
Jan.	7,355	4,537	661	509	5,707	13,062
Feb.	7,066	4,881	689	505	6,075	13,141
Mar.	8,415	5,861	828	512	7,201	15,616
Apr.	7,732	5,209	748	606	6,563	14,295
May	6,643	4,278	768	496	5,542	12,185
June	6,589	4,885	722	591	6,198	12,787
July	5,469	3,830	535	430	4,795	10,264
Aug.	6,784	4,514	770	547	5,831	12,615
Sept.	7,452	5,505	730	595	6,830	14,282
Oct.	7,209	5,704	739	614	7,057	14,266
Nov.	6,620	5,954	829	603	7,386	14,006
Dec.	6,344	5,599	717	587	6,903	13,247
Yr.-end adj.	+2,800	+2,775		+1,900	+4,675	+7,475
Total	86,478	63,982	8,736	8,495	81,213	167,691
1956						
Jan.	6,776	5,858	772	670	7,300	14,076
Feb.	6,399	5,913	787	730	7,430	13,829
Mar.†	6,138	6,043	714	733	7,490	13,628

Source: Chemical & Rubber Division, Business & Defense Services Administration, United States Department of Commerce.
† Preliminary.
* Includes SBR-Types.

Carbon Black Statistics — First Quarter, 1956

Furnace blacks are classified as follows: SRF, semi-reinforcing furnace black; HMF, high modulus furnace black; FEF, fast-extruding furnace black; HAF, high abrasion furnace black; SAF, semi-abrasion furnace black.

(Thousands of Pounds)

	Jan.	Feb.	Mar.
Production			
Furnace types			
Thermal	11,874	11,478	12,127
SRF	34,047	30,367	31,692
HMF	10,401	8,681	7,984
FEF	20,776	19,518	21,359
HAF	36,802	36,807	38,058
SAF, ISAF	13,918	13,555	16,228
Total furnace	127,818	120,406	127,448
Contact types	32,222	28,717	31,552
Totals	160,040	149,123	159,000
Shipments			
Furnace types			
Thermal	11,876	11,361	11,204
SRF	32,165	26,973	27,492
HMF	9,453	8,420	9,051
FEF	19,381	16,379	17,559
HAF	36,934	35,142	36,374
SAF, ISAF	14,500	14,762	15,637
Total furnace	124,279	113,037	117,317
Contact types	33,256	31,548	30,377
Totals	157,535	144,585	147,694
Producers' Stocks, End of Period			
Furnace types			
Thermal	6,013	6,130	7,053
SRF	21,021	24,415	28,615
HMF	21,304	21,565	20,498
FEF	24,957	28,096	31,896
HAF	36,323	37,988	39,672
SAF, ISAF	26,669	25,462	26,053
Total furnace	136,287	143,656	153,787
Contact types	95,294	92,463	93,638
Totals	231,581	236,119	247,425
Exports			
Furnace types	21,806	24,725	
Contact types	11,886	15,097	
Totals	33,692	39,822	

Source: Bureau of Mines, United States Department of the Interior, Washington, D. C.

Western Representative: FRED L. BROOKE CO., P. O. Box 463, Oak Park, Ill.

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World Production ot Natural Rubber

(1,000 Long Tons)

Year	Malaya		Indonesia		All Other	Total
	Estate	Native	Estate	Native		
1949	400.8	270.7	169.1	263.9	385.5	1,490.0
1950	376.7	317.4	175.1	521.4	469.4	1,860.0
1951	328.8	276.5	222.5	591.9	465.3	1,885.0
1952	341.7	242.5	293.2	456.0	456.6	1,790.0
1953	341.8	232.6	301.8	390.4	458.4	1,725.0
1954						
Jan.	30.3	19.1	24.2	34.9	44.0	152.5
Feb.	25.4	18.0	23.0	30.2	30.9	127.5
Mar.	24.6	17.5	23.2	36.7	35.5	137.5
Apr.	24.8	15.4	21.2	37.0	34.1	132.5
May	27.6	18.6	22.9	32.9	30.5	132.5
June	27.0	16.3	21.0	33.5	39.7	137.5
July	31.0	23.0	26.8	46.2	38.0	165.0
Aug.	30.9	21.6	21.9	37.1	38.5	150.0
Sept.	30.1	23.4	23.6	46.4	41.5	165.0
Oct.	29.5	20.8	23.9	45.6	40.2	160.0
Nov.	31.9	22.9	24.3	36.8	46.6	162.5
Dec.	30.4	24.2	24.5	47.0	53.9	180.0
Total	343.5	240.8	280.5	464.3	473.4	1,802.5
1955						
Jan.	29.3	27.9	23.6	17.1	42.1	140.0
Feb.	28.5	20.4	22.3	48.1	38.2	157.5
Mar	27.5	26.7	23.0	23.8	39.0	140.0
Apr.	24.2	20.5	20.7	27.4	42.2	135.0
May	27.4	22.4	18.0	30.1	37.1	135.0
June	27.6	22.9	21.3	52.7	40.5	165.0
July	30.3	25.7	21.2	32.5	55.3	165.0
Aug.	30.7	23.6	20.0	43.2	37.5	155.0
Sept.	31.3	24.9	20.3	45.2	45.8	167.5
Oct.	30.8	24.0	22.0	44.8	48.4	170.0
Nov.	30.3	21.9	23.4	37.3	44.6	157.5
Dec.	35.0	27.3	24.5	70.2	50.5	207.5
Total	352.9	286.2	261.3	472.4	521.2	1,895.0
1956						
Jan.	32.6	26.5	23.5	17.4	42.5	142.5
Feb.	27.6	24.3	23.0	20.9	36.7	132.5

Source: BDSA, United States Department of Commerce; Secretariat of the International Rubber Study Group; and United Baltic Corp., Ltd.

World Consumption of Natural Rubber

(1,000 Long Tons)

Year	United States	U.S.S.R.* and China	United Kingdom	Other Foreign	Total Foreign	Grand* Total
1949	574.5	132.5	184.3	546.2	863.0	1,437.5
1950	720.3	152.5	219.7	612.5	984.7	1,705.0
1951	454.0	136.3	234.2	675.5	1,046.0	1,500.0
1952	453.8	146.8	197.3	652.1	996.2	1,450.0
1953	553.5	101.9	206.6	753.0	1,061.5	1,615.0
1954						
Jan.	47.0	7.8	20.3	67.4	95.5	142.5
Feb.	46.9		17.5	70.6	88.1	135.0
Mar.	53.7	2.7	19.1	72.0	93.8	147.5
Apr.	51.4	15.5	19.7	68.4	103.6	155.0
May	51.4	1.1	18.8	66.2	86.1	137.5
June	54.2	3.6	18.0	64.1	85.7	140.0
July	37.9	0.8	17.7	68.6	87.1	125.0
Aug.	38.1	8.9	14.2	63.8	86.9	125.0
Sept.	52.4	11.5	19.3	71.8	102.6	155.0
Oct.	56.0	3.5	23.1	74.9	101.5	157.5
Nov.	53.3	2.3	19.2	75.2	96.7	150.0
Dec.	55.2	5.0	19.6	72.7	97.3	152.5
Total	597.5	62.7	226.5	835.7	1,124.9	1,725.0
1955						
Jan.	56.9	7.8	23.5	71.8	103.1	160.0
Feb.	51.0		20.1		89.0	140.0
Mar.	58.5	7.3	21.4	72.8	101.5	160.0
Apr.	53.0		23.3		104.5	157.5
May	54.7		20.5		97.8	152.5
June	56.3	2.8	18.3	80.1	101.2	157.5
July	46.2	1.8	18.3	73.7	93.8	140.0
Aug.	48.4	0.1	16.0	65.5	81.6	130.0
Sept.	51.0	2.1	19.8	72.1	94.0	145.0
Oct.	55.0	10.4	22.9	76.7	110.0	165.0
Nov.	52.8	17.1	20.0	77.6	114.7	167.5
Dec.	51.2	5.2	22.2	83.9	111.3	162.5
Total	634.8	56.2	246.3	900.2	1,202.7	1,837.5
1956						
Jan.	53.4	14.4	21.7	73.0	109.1	162.5
Feb.	50.1	19.1	17.9	72.9	109.9	160.0

Source: BDSA, United States Department of Commerce; Secretariat of the International Rubber Study Group; and United Baltic Corp., Ltd.
* Estimated.

World Production of Synthetic Rubber

(1,000 Long Tons)

Year	U.S.A.	Canada	Germany*	Total
1950	476.2	58.4	....	534.6
1951	845.2	62.3	0.9	908.4
1952	798.6	74.3	4.9	877.8
1953	848.4	80.9	6.3	935.6
1954	622.9	86.6	6.9	716.4
1955				
Jan.	69.9	8.1	0.9	78.9
Feb.	67.7	7.6	0.9	76.2
Mar.	78.5	8.7	0.8	88.0
Apr.	75.7	7.6	0.8	84.1
May	82.0	8.9	0.9	91.7
June	78.2	8.6	0.9	87.7
July	81.9	8.2	0.9	91.0
Aug.	84.0	8.1	1.0	93.1
Sept.	83.5	9.3	0.9	93.7
Oct.	89.1	9.9	1.0	100.0
Nov.	91.3	9.2	1.0	101.5
Dec.	90.3	9.7	1.0	101.0
Total	970.5	103.9	10.9	1,085.3
1956				
Jan.	93.5	9.7	....	....
Feb.	90.5	8.2	....	....

Source: Secretariat of the International Rubber Study Group; and BDSA, United States Department of Commerce.
* British Zone only for 1947; Bizone for 1948 and 1949; Federal Republic since 1950.

World Consumption of Synthetic Rubber*

(1,000 Long Tons)

Year	U.S.A.	Canada	United Kingdom	Total† Continent of Europe	World† Grand Total
1950	538.3	22.6	2.8	16.0	580.0
1951	758.9	26.4	3.9	22.3	812.5
1952	807.0	33.6	4.9	35.0	885.0
1953	784.8	35.9	4.9	39.3	872.5
1954	636.7	30.1	8.7	50.8	740.0
1955					
Jan.	68.4	2.6	1.2	5.8	80.0
Feb.	67.6	3.1	1.1	5.5	77.5
Mar.	77.1	3.4	1.2	6.0	90.0
Apr.	72.1	3.0	1.5	5.8	85.0
May	75.7	3.3	1.4	6.0	87.5
June	80.2	3.8	1.5	6.5	92.5
July	63.3	2.7	1.4	6.3	75.0
Aug.	73.3	2.7	1.5	6.3	87.5
Sept.	76.7	3.7	1.9	7.0	92.5
Oct.	80.4	3.6	2.6	7.5	97.5
Nov.	81.7	4.4	2.4	8.0	97.5
Dec.	80.5	4.0	2.7	7.8	95.0
Total	894.9	40.2	20.5	78.3	1,057.5
1956					
Jan.	78.4	4.0	3.1	7.5	97.5
Feb.	76.1	4.1	3.1	7.5	95.0

Source: Secretariat of the International Rubber Study Group; BDSA, United States Department of Commerce.
* Includes latices.
† Figures estimated or partly estimated.

U.S.A. Rubber Industry Sales and Inventories

(Million of Dollars)

	Value of Sales*				Manufacturers' Inventories*			
	1953	1954	1955	1956	1953	1954	1955	1956
Jan.	424	348	424	415	866	844	790	935
Feb.	435	351	440	...	868	857	782	...
Mar.	473	388	466	...	880	849	805	...
Apr.	444	375	445	...	874	812	784	...
May	422	357	465	...	888	810	810	...
June	436	377	465	...	914	829	850	...
July	448	374	471	...	925	784	853	...
Aug.	409	337	456	...	897	761	863	...
Sept.	416	334	456	...	908	804	874	...
Oct.	395	332	447	...	881	838	902	...
Nov.	346	388	482	...	867	819	935	...
Dec.	369	407	465	...	868	929	934	...
Total	5,017	4,368	5,493	....	Av. 853	831	845	....

Source: Office of Business Economics, U. S. Department of Commerce.
* Adjusted for seasonal variation.

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U.S.A. Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
Passenger Car						
1955						
Jan.	3,481	4,139	79	7,699	7,797	12,363
Feb.	3,540	3,551	83	7,174	7,549	12,643
Mar.	4,326	4,255	104	8,685	8,810	12,874
Apr.	3,967	4,677	88	8,733	8,000	12,197
May	3,871	4,705	87	8,663	8,742	12,235
June	3,482	5,399	97	8,979	9,383	12,698
July	3,461	4,802	76	8,339	7,893	12,199
Aug.	2,984	5,058	60	8,103	7,585	11,636
Sept.	2,749	4,366	74	7,189	7,882	12,407
Oct.	3,172	3,556	74	6,802	8,160	13,806
Nov.	3,900	2,902	63	6,865	8,198	15,142
Dec.	3,641	2,746	81	6,467	7,223	15,963
Total	42,574	50,156	966	93,698	97,232	
1956						
Jan.	2,958	4,040	66	7,064	7,661	16,546
Feb.	2,919	3,387	90	6,396	7,571	17,701
Mar.	3,027	4,372	65	7,464	7,812	18,096
Truck and Bus						
1955						
Jan.	303	827	81	1,211	1,243	2,586
Feb.	294	730	74	1,098	1,196	2,678
Mar.	454	672	96	1,222	1,273	2,734
Apr.	489	639	76	1,204	1,153	2,693
May	481	655	65	1,202	1,208	2,701
June	449	730	76	1,255	1,320	2,763
July	429	909	51	1,389	1,134	2,485
Aug.	378	922	59	1,359	1,132	2,272
Sept.	393	804	66	1,264	1,243	2,268
Oct.	324	904	88	1,315	1,395	2,357
Nov.	403	690	87	1,180	1,405	2,584
Dec.	404	552	91	1,047	1,255	2,815
Total	4,801	9,034	910	14,746	14,957	
1956						
Jan.	444	629	65	1,139	1,318	2,971
Feb.	424	565	88	1,077	1,326	3,232
Mar.	439	662	62	1,163	1,382	3,465
Total Automotive						
1955						
Jan.	3,785	4,967	159	8,911	9,040	14,949
Feb.	3,833	4,281	157	8,272	8,745	15,321
Mar.	4,780	4,926	201	9,907	10,083	15,609
Apr.	4,457	5,315	165	9,937	9,153	14,890
May	4,352	5,361	152	9,865	9,949	14,936
June	3,931	6,129	174	10,234	10,703	15,460
July	3,890	5,711	128	9,729	9,027	14,684
Aug.	3,362	5,980	119	9,462	8,717	13,908
Sept.	3,142	5,171	140	8,453	9,125	14,675
Oct.	3,495	4,460	161	8,117	9,555	16,163
Nov.	4,303	3,592	150	8,045	9,603	17,727
Dec.	4,045	3,298	172	7,515	8,478	
Total	47,375	59,191	1,878	108,447	112,178	
1956						
Jan.	3,402	4,669	131	8,203	8,979	19,517
Feb.	3,343	3,953	178	7,473	8,897	
Mar.	3,466	5,034	127	8,627	9,193	21,562

Source: The Rubber Manufacturers Association, Inc.

U.S.A. Synthetic Rubber Industry, Wages, Hours

Year	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings
1954	$90.76	40.7	$2.23
1955			
Jan.	93.02	40.8	2.28
Feb.	93.07	41.0	2.27
Mar.	94.12	41.1	2.29
Apr.	99.53	42.9	2.32
May	95.22	41.4	2.30
June	96.51	41.6	2.32
July	97.53	41.5	2.35
Aug.	99.96	42.0	2.38
Sept.	100.08	41.7	2.40
Oct.	98.83	41.7	2.37
Nov.	100.14	41.9	2.39
Dec.	100.98	41.9	2.41
1956			
Jan.	100.38	42.0	2.39

U.S.A. Rubber Industry Employment, Wages, Hours

Year	Production Workers (1000's)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Consumers Price Index
All Rubber Products					
1939	121	$27.84	39.9	$0.75	
1952	212	74.48	40.7	1.83	113.5
1953	221	77.78	40.3	1.93	114.4
1954	195	78.21	39.7	1.97	114.8
1955					
Jan.	210.5	84.25	41.3	2.04	114.3
Feb.	210.4	84.25	41.3	2.04	114.3
Mar.	211.2	83.44	40.9	2.04	114.3
Apr.	211.6	86.11	41.8	2.06	114.2
May	214.4	86.94	41.8	2.08	114.2
June	220.0	88.83	42.3	2.10	114.4
July	216.9	86.52	41.2	2.10	114.7
Aug.	219.0	86.32	41.3	2.09	114.5
Sept.	223.1	86.74	41.5	2.09	114.9
Oct.	226.4	89.04	42.0	2.12	114.9
Nov.	231.2	92.01	42.4	2.17	115.0
Dec.	233.9	89.21	41.3	2.16	
1956					
Jan.	233.3	88.34	40.9	2.16	114.6
Feb.	229.4				114.6
Tires and Tubes					
1939	54.2	$33.36	35.0	$0.96	
1952	92.9	85.65	40.4	2.12	
1953	93.0	88.31	39.6	2.23	
1954	79.7	87.85	38.7	2.27	
1955					
Jan.	87.6	97.41	41.1	2.37	
Feb.	86.5	96.46	40.7	2.37	
Mar.	87.4	95.27	40.2	2.37	
Apr.	88.4	101.28	42.2	2.40	
May	90.1	100.91	41.7	2.42	
June	91.0	105.60	43.1	2.45	
July	91.5	103.82	42.7	2.42	
Aug.	91.0	102.72	42.1	2.44	
Sept.	91.9	101.02	41.4	2.44	
Oct.	92.3	103.74	42.0	2.47	
Nov.	94.2	106.26	42.0	2.53	
Dec.	94.7	99.50	39.8	2.50	
1956					
Jan.	94.9	102.66	40.9	2.51	
Rubber Footwear					
1939	14.8	$22.80	37.5	$0.61	
1952	22.9	62.22	40.4	1.54	
1953	23.7	65.60	40.0	1.64	
1954	20.7	67.43	39.9	1.69	
1955					
Jan.	22.1	68.97	40.1	1.72	
Feb.	21.5	69.72	40.3	1.73	
Mar.	21.4	69.72	40.3	1.73	
Apr.	21.2	70.99	40.8	1.74	
May	21.4	70.64	40.6	1.74	
June	21.6	71.34	41.0	1.74	
July	21.8	71.93	41.1	1.75	
Aug.	21.5	67.25	39.1	1.72	
Sept.	23.5	67.60	39.3	1.72	
Oct.	24.4	69.20	40.0	1.73	
Nov.	25.5	77.89	42.1	1.85	
Dec.	26.2	74.89	40.7	1.84	
1956					
Jan.	26.1	74.59	40.1	1.86	
Other Rubber Products					
1939	51.9	$23.34	38.9	$0.61	
1952	96.0	66.58	41.1	1.62	
1953	104.1	70.93	41.0	1.73	
1954	94.3	71.91	40.4	1.78	
1955					
Jan.	100.8	76.08	41.8	1.82	
Feb.	101.4	76.86	42.0	1.83	
Mar.	102.4	76.13	41.6	1.83	
Apr.	101.1	76.13	41.6	1.83	
May	105.0	78.31	42.1	1.86	
June	106.4	77.93	41.9	1.86	
July	103.6	73.84	39.7	1.86	
Aug.	104.3	75.85	41.0	1.85	
Sept.	107.7	78.96	42.0	1.88	
Oct.	109.7	80.56	42.4	1.90	
Nov.	111.5	83.03	42.8	1.94	
Dec.	113.0	83.69	42.7	1.96	
1956					
Jan.	112.3	79.54	41.0	1.94	

Source: BLS, United States Department of Labor.

SITUATIONS OPEN (Continued)

WANTED

MANUFACTURER'S AGENT for line of Neoprene and Hypalon protective coatings. Eastern seaboard and midwestern states. Address Box 1926, care of RUBBER WORLD.

RUBBER CHEMIST WANTED FOR MEDIUM-SIZE PLANT IN Ohio. Good academic background plus practical viewpoint from at least 10 years' experience. Position requires versatility, with latex dipping experience preferred and molded goods experience desirable. Very good future prospects in growing concern of excellent reputation with fine laboratory facilities. Our personnel know of this ad. Address Box No. 1927, care of RUBBER WORLD.

TECHNICAL SALES REPRESENTATIVE

Must have sales experience and good technical background in adhesives for rubber bonding. To travel in northeastern United States. Good opportunity with progressive, expanding company. Address Box No. 1928, care of RUBBER WORLD.

WANTED: MAN FOR LABORATORY COMPOUNDING AND follow-up of compounds in production. Medium-size rubber company located in southern Rhode Island. Address Box No. 1929, care of RUBBER WORLD.

RUBBER CHEMIST

Expanding Chicago-area concern compounds rubber mainly for lining of chemical equipment; some work in extrusion and compression molding. Man needed to assume responsibilities of product control and practical research. Degree required; some customer contact work; some experience in plastics desirable, but not essential. Please send detailed résumé, stating salary requirements. Address Box No. 1930, care of RUBBER WORLD.

RUBBER CHEMIST

We need a man to be responsible for product control, practical research, and some customer contact work. Some experience with plastics helpful. Major emphasis on formulating compounds to meet automotive specifications, oil seals, and hydraulic brake applications. Include detailed résumé and starting salary required. Address Box No. 1931, care of RUBBER WORLD.

CHEMIST—SEALING COMPOUND FORMULATOR

For automotive bodies, refrigerators, etc., Polybutene and related types. Excellent opportunity in laboratory of small adhesive firm with good growth record. Located in Michigan. Salary commensurate with experience. Give details of experience and salary requirements. All replies confidential. Address Box No. 1932, care of RUBBER WORLD.

TECHNICAL SALES REPRESENTATIVE

Excellent opportunity for chemist or chemical engineer with 5 to 7 years' experience in rubber compounding and processing having desire to enter sales field with Rubber Chemicals Division handling synthetic rubber and allied chemicals. Midwest location. Send résumé on education and experience, with recent photo. All replies strictly confidential, and our employes are aware of this ad. Address Box 1934, care of RUBBER WORLD.

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for development of adhesives. Experience in formulation of synthetic rubber-base adhesives imperative. Excellent opportunity in successful company. Replies held confidential. Contact H. C. Engel, Bloomingdale Rubber Company, P. O. Box 59, Chester, Pa.

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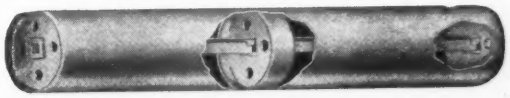

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1952									
Jan.-Mar.	11,226	36,378	12,971	60,575	14,434	72,249	86,683	1,291	87,974
Apr.-June	4,661	24,612	10,742	40,015	16,874	81,249	98,123	1,463	99,586
July-Sept.	335	9,257	9,460	19,052	18,128	80,355	98,483	2,567	101,050
Oct.-Dec.	‡	4,587	11,787	16,374	19,436	81,171	100,607	2,761	103,368
Total	15,887	74,834	48,280	139,001	68,873	315,024	383,897	8,082	391,979
1953									
Jan.-Mar.	‡	4,378	15,878	20,256	20,487	91,742	112,229	4,074	116,303
Apr.-June	‡	5,713	16,383	22,096	18,906	95,711	114,617	4,128	118,745
July-Sept.	‡	3,562	13,273	16,835	18,597	89,821	108,418	5,402	113,820
Oct.-Dec.	‡	2,460	11,569	14,029	19,664	74,013	93,677	5,246	98,923
Total	‡	16,113	57,103	73,216	77,654	351,287	428,941	18,850	447,791
1954									
Jan.-Mar.	‡	2,585	13,229	15,814	17,297	73,068	90,365	5,320	95,685
Apr.-June	‡	4,067	12,830	16,897	12,436	66,796	79,232	8,357	87,589
July-Sept.	‡	2,104	9,321	11,425	12,851	50,136	62,987	6,754	69,741
Oct.-Dec.	‡	3,743	12,476	16,219	14,609	76,931	91,540	9,338	100,878
Total	‡	12,499	47,856	60,355	57,193	266,931	324,124	29,769	353,893

	Cotton and Nylon[a]		Rayon Tire Cord		
	Cotton Chafer Fabrics and All Other Tire Fibers	Cotton and Nylon Tire Cord and Fabric	Woven	Not Woven	Total All Tire Cord and Fabrics
1955					
Jan.-Mar.	12,763	14,870	79,191	20,299	127,123
Apr.-June	12,728	18,527	80,908	21,550	133,713
July-Sept.	12,941	16,093	81,996	20,740	131,770
Oct.-Dec.	12,333	15,754	77,600	24,343	130,030

* Fuel cell fabrics not included with rayon and nylon tire cord and fabrics.
† Included with "Chafer and All Other Tire Fabrics" to avoid disclosing data for individual mills.
‡ Included with "Tire Cord Fabric Woven" to avoid disclosing data for individual mills.
[a] Cotton and nylon figures combined to avoid disclosing data for individual companies.
Source: Bureau of the Census, United States Department of Commerce.

New Publications

(Continued from page 470)

Publications of the Office of Technical Services, United States Department of Commerce, Washington, D. C.:

"A Study and Evaluation of Kel-F Elastomer." PB 111984. 41 pages. Price, $1.25. This report of an investigation of Kel-F Elastomer at Wright Air Development Center reveals that Kel-F may prove useful for aircraft hydraulic system applications up to 400° F. It was also found to have exceptional resistance to potential rocket fuels. Particularly important to rubber compounders is the discovery that prolonged milling is required during compounding to obtain uniform physical properties.

"Elastomeric Dithiopolyesters." PB 111949. 25 pages. Price, 75¢. Two general types of these elastomers were investigated at Wright Air Development Center: one obtained by reaction of an experimental liquid polymer with organic and inorganic peroxides; the other obtained by reaction of terminal mercapto groups with unsaturated aldehydes. This report concerns the behavior of vulcanizates of these elastomers in fuels and synthetic ester-base oils and the effects of aging at elevated temperatures.

"Fluorine-Containing Polyethers." PB 111986. 57 pages. Price, $1.50. This report is about research at Wright Air Development Center whose purpose was to synthesize fluorine-containing polymers of the polyether type for evaluation as sealants, rubbers, coatings, and adhesives. The desired properties were high thermal stability, fuel and oil resistance, retention of properties at —65° F., and resistance to fuming nitric acid and ozone. Appreciable quantities of two monomers were prepared by reactions involving the dehydrohalogenation of the corresponding halohydrins.

"Poly FBA—A Fluorinated Acrylic Elastomer for High-Temperature Service in the Presence of Aircraft Fuels and Lubricants." PB 111946. 60 pages. Price, $1.50. An analysis of the properties and applications of Poly FBA, a new synthetic elastomer having a unique combination of fuel, oil, and solvent resistance and high-temperature stability, is contained in this Wright Center report. Results of tests suggest application of the elastomer in a variety of types of mechanical goods including seals, diaphragms, hose, coated fabrics, and other items.

"Evaluation of Organic Fluorine Compounds for Use in Military Aircraft." PB 111983. 22 pages. Price, 75¢. This Wright Center report describes various fluorine compounds evaluated for use as fire-extinguishing agents, acid-resistant coatings and greases, non-flammable hydraulic fluids, elastomers, electronic equipment, and fungicides. Polymers of monochlorotrifluoroethylene and tetrafluoroethylene were used successfully as seals, gaskets, and in lubricants.

"Central Hydraulic Systems." Bulletin 900. Greer Hydraulics, Inc., Jamaica, N. Y. 8 pages. How the company's hydro-pneumatic accumulators can reduce the size, complexity, and operating costs of hydraulic molding equipment in the rubber and plastics industries is described in this illustrated brochure.

DTBP-Substitute

(Continued from page 460)

is "locked in" so that it cannot evaporate. Shelf life of the composition is reported to be six months or more.

According to Union Carbide, X-1960 gives lowest compression set values, allows thick-section cures without tedious stepwise postcures, minimizes harmful catalyst residues in the rubber, enables carbon black to be used as a reinforcing filler, disperses more easily than other catalysts, and permits catalyzed stocks to be held for as long as two weeks without loss of catalyst. Fabricators using X-1960 mix a small amount with the compound while replasticizing on the mill in the same way that other peroxide pastes are currently being used, UCC declares. The catalyst composition must be used only with the company's silicone rubber gums and not with ordinary dimethyl silicone gums.

An advance technical data sheet, SF-1002, describing X-1960, giving suggestions for compounding and handling, and reporting the typical physical properties of X-1960 catalyzed Union Carbide silicone rubber compounds is available from the company on request.

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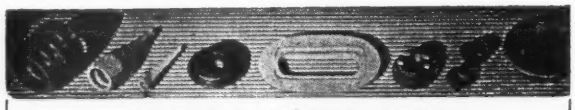

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